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OFFICE OF APPALACHIAN STUDIES. CORPS OF ENGINEERS

P. O. BOX 1159 CINCINNATI, OHIO 45201

IN REPLY REFER TO

TO: THE READER

This volume (Number 14) is one of two that comprise Part V, "State Water Supplements," to the Main Report for Development of Water Resources in Appalachia. The volume contains, in order, the supplements prepared by the States of Ohio, Pennsylvania, South Carolina, Tennessee, Virginia and West Virginia. Supplements for the remaining seven States in the Appalachian Region are contained in Volume 13.

During the study, State Representatives to the Water Development Coordinating Committee for Appalachia decided that they wished to present their evolving state water plans in the report. Each state has presented its plans, projects and future hopes covering development and management of the state's water and related resources. Some states have presented detailed analyses and proposed further extensive studies; others reflect an opinion that the present level of management of water resources is generally adequate and, in their State Water Supplements, have presented statements of support for going programs. These reports present the views of the individual States. Volumes 13 and 14 of this report will undoubtedly become a benchmark in State participation in water resources planning.

In addition to these supplements, the four Southern Appalachian States of South Carolina, Georgia, Alabama and Mississippi, also provided reports concerning their Laws, Policies and Programs pertaining to water and related land resources. These four documents are contained in Part VI (History, Coordination and Cooperation) of this report. Similar information had previously been prepared by the other 9 Appalachian States for inclusion in the published Ohio River Basin Comprehensive Survey. Those 9 documents are contained in Appendix J (Volume XI) of that report.

Programs and projects recommended in the State Water Supplements have been helpful in formulating the plans for water resources development presented elsewhere in this report. A full index of all report components is included on the following two pages.

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COLOnel, Corps of Engineers Director

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For
DEVELOPMENT OF WATER
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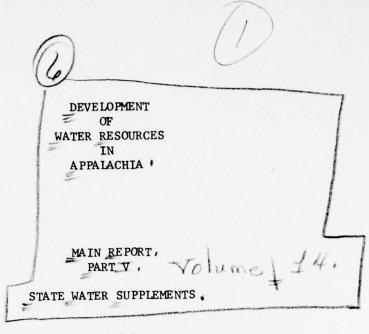
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Prepared by: The Thirteen Appalachian States

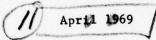
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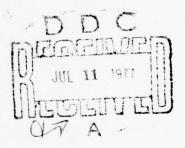
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PART V
STATE WATER SUPPLEMENTS

CHAPTER 8
OHIO WATER SUPPLEMENT

Prepared by
The Ohio Department of Natural Resources
Division of Water

1969

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

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The Appalachian Region in Ohio includes the following counties:

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Adams	Gallia	Jefferson	Perry
Athens	Guernsey	Lawrence	Pike
Belmont	Harrison	Meigs	Ross
Brown	Highland	Monroe	Scioto
Carroll	Hocking	Morgan	Tuscarawas
Clermont	Holmes	Muskingum	Vinton
Coshocton	Jackson	Noble	Washington

FIGURE 1

I. INTRODUCTION

Appalachia is being challenged by a multiple-agency approach at all levels - Federal, State and local - yet it is a cooperative process by which functional plans and programs may be brought together for overall, or comprehensive, consideration.

Basically, Ohio's Appalachian program is administered by the Governor through the Department of Urban Affairs and its Office of Appalachia. The Department of Development provides basic planning direction and promotes industrial development. The Department of Highways is responsible for highway planning and development. The Department of Health is concerned with health activities including public water supplies and pollution abatement. The Department of Natural Resources has authority in recreation, fish and wildlife, forestry, strip mine reclamation and regional water planning.

This Supplement to the Report for Development of Water Resources in Appalachia has been prepared by the Division of Water in the Department of Natural Resources. It is not intended to be an analytical survey of all the facets of Ohio's Appalachian Region, but rather to present a compendious discussion of the Region with emphasis on water resources.

II. THE AREA AND ITS ECONOMY

The Appalachian Region in Ohio, shown on figure 1, generally encompasses the hilly, unglaciated southeastern sections of the State. It includes 28 counties covering 13,700 square miles or 1/3 of the State's land area. The Region had an estimated population of 1,163,187 as of July 1, 1967, or approximately 10% of the total State population, now in excess of 10-1/2 million persons.

Population growth in Ohio's Appalachian Region has markedly lagged the rest of the State. In the period 1900 to 1967, the Region's population increased by only 260,000 persons - a 29% increase - while the other two-thirds of the State increased by 6-1/3 million persons - almost a 200% increase.

Distribution of the Region's population is not uniform and three-fourths of the inhabitants are located in only half of the 28 counties. Major urban centers have developed almost exclusively at locations along the Region's largest rivers - the Ohio, the Scioto, the Hocking, and the Muskingum and several of its tributaries - signifying the early and continued dependence upon the water availability, transportation routes and level flood plains associated with these corridors.

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Chief among the factors which have inhibited economic development and growth in Ohio Appalachia is the generally rugged terrain which serves to isolate the Appalachian community. Most of the Region is within the unglaciated plateau area with the landscape being generally rough and well dissected, the only departures from this pattern being the broad valleys of the major streams and the southwest portion which was covered by glacial ice. Glacial outwash materials consisting mostly of sand and gravel are present in valleys south of the glacial line. These valley deposits are often excellent sources of underground water supplies.

Highway programs, particularly the Interstate and Appalachian programs, are improving travel to and within Ohio Appalachia, thus overcoming much of theisolation of the Region. The north-south Interstate Route 77 will connect the Northeast Ohio industrial area with Marietta on the Ohio River, also serving the Dover-New Philadelphia area and interchanging with Interstate 70 at Cambridge. Interstate 70 provides an east-west route between Columbus, the State Capitol, and the Martins Ferry-Bellaire area along the Ohio River, across from Wheeling, West Virginia. The route passes through Zanesville, on the Muskingum River, now the largest of Ohio's Appalachian cities.

The Appalachian highway system will serve the southern part of the area with corridor "D" running east from Cincinnati to the Ohio River and Interstate 77 at Parkersburg, West Virginia. Corridor "B" and "C" will improve the access to Columbus on the north and to Portsmouth and beyond the Ohio River on the south.

Other important routes being improved include State Route 7 and U. S. 52 along the Ohio River, U. S. 33 from Columbus to Pomeroy, and U. S. 35 from Chillicothe to Gallipolis.

The loss of the Silver Bridge and subsequent closing of several other bridges over the Ohio River have emphasized the need for additional river crossings.

Rail transportation is generally adequate throughout the interior of Ohio Appalachia. Along the Ohio River, however, the rail lines are more often than not on the opposite side of the river.

The Ohio River, which forms the 400 mile long eastern and southern boundary of Ohio Appalachia, has been canalized throughout its entire length and is a vital transportation artery.

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In addition to the other modes of transportation, numerous airports are located in Ohio Appalachia. A program of State assistance was initiated to help finance county airport projects. Twenty-four of

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the twenty-eight counties have a completed airstrip or one under construction. Hangers and other facilities, however, may be limited or lacking. Several of the counties adjacent to the Ohio River have access to airports across the river.

Ohio Appalachia is endowed with a variety of natural resources. Important mineral resources which are mined or quarried include coal, limestone, dolomite, sand, gravel, sandstone, clay, shale, and brines. Oil and gas extraction is also an important activity.

Coal is the most important of these resources and is mined in all but the seven western Appalachian counties. Total production during 1967 in the 21 coal producing Appalachian counties was 43.6 million tons with a value at the mine of almost 170 million dollars.

Ohio's coal production has been increasing in recent years, however, this increased production has been accomplished mainly through improved mining technology rather than expansion of mining employment. Surface mining methods account for two-thirds of the total production.

Ohio Appalachia's land and forest resources have long been abused and misused. During the early days of settlement many acres were stripped of forests and placed under cultivation. Much of this land was unsuited for cropping and never produced a healthy agricultural economy. In recent years large acreages have reverted to low-grade pastures and forests. Sizable acreages have been stripmined and must be reclaimed to again become useful.

With proper management, many acres can be made suitable for the production of pasture crops, an essential in developing a good livestock program. An even greater amount of land is perhaps best suited to forestry or forestry related recreation.

The water resources of Ohio Appalachia include both surface water and underground sources. Vast quantities of water flow daily past the 12 counties bordering the Ohio River. The larger tributary streams also have good sustained flows. Substantial supplies can be developed on many of the small streams through the use of storage reservoirs.

Large underground supplies are available only from unconsolidated deposits in the major river valleys. Valley fill deposits, underlying and adjacent to the Ohio and Scioto Rivers and parts of the Muskingum, Hocking and Little Miami River systems, are capable of supplying large quantities of water to wells, suitable for moderate industrial and municipal supplies.

Elsewhere, small supplies suitable only for domestic requirements are available from the bedrock formations. Bedrock beneath most of the area consists of alternating sandstones and shales with interbedded

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limestones and coals. Where thick, porous sandstones are present, adequate groundwater supplies are available. In areas where the bedrock is predominantly shale, meager supplies are obtained.

Quality of water in the Region is unsatisfactory at a number of locations for varied reasons. The Region's wealth in coal has led to one of the more serious problems - acid mine drainage. Acid water from mined areas has affected the quality of water in the Raccoon, Hocking and Muskingum basins. Raccoon Creek is highly acid from the headwaters to the junction with the Ohio River. The water quality of the Hocking River is influenced significantly by acid mine drainage from Little Rush, Rush, Monday, Sunday, and Federal Creeks. Just downstream from Logan, the Hocking River has been degraded by brine discharges from oil well operations. In the Muskingum River basin, Jonathan and Moxahala Creeks, arising in Perry County, and Brush Creek, in Muskingum County, are the streams most severely contaminated by acid mine drainage. Other areas in the Muskingum basin are affected, but less severely. A number of the small streams which drain directly into the Ohio River are significantly affected by acid mine wastes.

Some localities downstream from eroding mine areas are subject to siltation problems. A notable example is Leading Creek in Meigs County.

Serious pollution of the Muskingum and Tuscarawas Rivers occurs as a result of industrial activity outside the Region. The high chloride content of the industrial discharge renders the Tuscarawas and Muskingum river water unsuitable for public water supplies and many manufacturing processes and endangers underground water supplies along the streams. Elsewhere, the Scioto River is affected by both municipal and industrial wastes but is improving. Quality of Ohio River water is improving under the direction of the Ohio River Valley Sanitation Commission (ORSANCO) although taste and odor are still troublesome.

Water Quality Standards are being adopted by the Ohio Water Pollution Control Board in accordance with the Federal Water Quality Act of 1965. The standards will require further pollution abatement measures by municipalities and industries, however, it is recognized that no practical solution to the acid mine drainage problem is yet available.

Inasmuch as the economic development and growth in the Region is largely aligned to the major river corridors, flood control has played an important role in the development of water resource projects. An endowed advantage in natural areas conducive to recreation along with good reservoir sites are perhaps the Region's most distinguished assets and are already being used to considerable advantage. The famed "Muskingum Project", a system of 14 reservoirs completed in 1938, are co-managed by the U. S. Army Corps of Engineers for flood control and the

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Muskingum Watershed Conservancy District for recreation. Dillon Reservoir, added to the Muskingum system in 1961, is also operated by the Corps for flood control, however, the reservoir lands are being managed by the State as Dillon State Park. Burr Oak Reservoir and State Park in the Hocking River basin is managed similarly with the added feature of water supply, included at the request of and necessary cooperation on the part of the State. Since completion of the reservoir in 1950, the State has constructed a water treatment plant and pipeline to serve a half dozen small communities whose water supplies were inadequate or contaminated by acid mine drainage.

The Logan Reservoir site in the Hocking Basin, being studied by the Corps' Office of Appalachian Studies, is capable of multiple-purpose development, including flood control, water supply, water quality control, recreation, fish and wildlife and economic enhancement.

In the Scioto River Basin, a comprehensive plan including 7 reservoirs is being carried out by the Corps of Engineers. Benefits to the Appalachian portion of the basin include flood control, water quality control, water supply and recreation.

The Whiteoak Reservoir project, being evaluated by the Office of Appalachian Studies, would provide multiple-purpose benefits and economic enhancement to the lower Whiteoak Basin.

East Fork Reservoir, one of two multiple-purpose reservoirs under construction by the Corps in the Little Miami River Basin, is located in Clermont County, the western edge of Ohio Appalachia.

Floods along the Ohio River are reduced by reservoir storage; however, many communities without additional local protection works are subject to damage during major floods. Two of the larger communities, Portsmouth-New Boston and Ironton, have protective works built by the Corps of Engineers. Other authorized projects along the Ohio River are currently inactive.

At interior locations, the Corps has completed the Roseville local protection project and is initiating construction at Athens. The Chillicothe project, as currently authorized, cannot be started until all upstream reservoirs are under construction.

Small watershed projects, under Public Law 566, are being carried out or planned at a number of locations, particularly in the Hocking River Basin. The State has joined in several 566 projects to assist in recreational development.

The State has constructed a notable multiple-purpose reservoir, Salt Fork, near Cambridge. Approximately 3,000 acres of water and 20,000 acres of land are being developed as a major State park. The project will also provide future water supplies for the Cambridge area. Rocky Fork, a 2,000-acre State lake in Highland County is extensively developed for recreation. A number of smaller State lakes have been constructed in the Appalachian Area and developed for general recreation or fish and wildlife.

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III. OUTLOOK FOR FUTURE DEVELOPMENT

The Appalachian Regional Development Program is designed to promote the economic and social development of the Region. Its success depends upon removing or minimizing those restraints characteristic to the Region. Such success must, however, be measured on a scale compatible with the Area's own resources and capabilities. Certainly, it would be unfair to compare the Region's industrial growth patterns to Ohio's Northeast Region or its agricultural capacity to Northwest Ohio. While there is no doubt as to the capability of Ohio Appalachia to respond to the Appalachian Regional Development Program, the basic pattern of development is already established by the very nature and distribution of its resources.

There is significant potential for industrial expansion along the valleys of the Ohio, Muskingum, Scioto and Hocking Rivers, where valley fill deposits often yield large underground water supplies. The advantages of the Ohio River in water transportation and large quantities of water available for cooling processes makes that area even more attractive to large industries. Application of programs to improve highway travel, vocational education, health facilities, etc., will have the greatest impact at these locations.

Inland areas, dotted here and there with a small hamlet or community, will be more resistant to improvement. The economy is mostly dependent upon mining, agricultural, forestry and recreational pursuits. Efforts to improve these areas have been made during the last several decades through stripmine reclamation laws and promotion of conservation practices.

The recovery of coal, particularly by strip mining methods, will continue to disturb many acres of land. Although acid mine drainage and other problems will continue as a result of this activity, improved reclamation practices will help to reduce their long term effect and return the land to other uses much sooner. Research of acid mine drainage, such as being conducted by the Ohio State University's Water Resources Center, is adding important knowledge and direction concerning the problem, but much additional research and evaluation is yet needed.

Much of the sloping agricultural land is unsuited to cultivation, being subject to severe erosion. Present trends show decreases in both crop production and farm population while beef cattle farming and the average size of farms appear to be increasing. The trend to larger and better managed farms and greater emphasis on livestock farming will continue although many small farming operations will also continue as parttime pursuits.

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Additional research is needed on speciality crops that may be suited to the region.

Forest lands in Ohio Appalachia have in the past often been mismanaged and misused. Estimates indicate that these forest lands and those reverting to forests now cover approximately 50 percent of the Region's land area, mostly privately owned. There are varied reasons for the lack of interest in management, such as absentee ownership, lack of good access, impending stripmining, etc., however, a great potential for increasing income from forest lands does exist.

The ruggedness of the Region itself, with forested hills paralleling scenic river areas or surrounding many man-made lakes, makes the area particularly attractive to the recreation seeker. The heavy use of the area's recreation facilities by persons living outside the Region indicates that our mobile population values natural beauty and will travel far for its enjoyment. Improved access into the Region, particularly from densely populated areas via Interstate Routes 77 and 70, and the Appalachian Highway, will undoubtly increase the area's use as a playground. Salt Fork State Park, for example, one of the State's newest and largest parks, is being developed on Interstate 77 near its intersection with Interstate 70 and will be only several hours away from a large segment of the State's population. The demands for goods and services in connection with recreation will establish a significant and highly important industry within the Region.

Considerable water resources development benefiting the Appalachian Region in Ohio has already been accomplished while others are presently underway or being considered.

One of the most urgent needs - and perhaps the most challenging problem - is to reduce contamination of surface streams and to protect valuable underground water supplies. Municipal and industrial waste discharges can be controlled with present technical knowledge, but a practical solution to the acid mine drainage problem is needed.

Flood control needs will remain acute in some areas due to continued development pressures on flood plain lands. However, both public officials and industry are becoming more aware of the need for proper flood plain management. The State has requested the Corps of Engineers to prepare flood plain information reports covering the length of the Ohio River along the State's boundary and for a number of locations along the larger tributaries. The U. S. Geological Survey is also preparing several urban flood maps.

The need for water supplies is a pressing problem in rural areas and for the survival of some small towns. The State established a precedent with the Burr Oak pipeline, however, a number of rural community areas are now being assisted by loans and grants through the Farmers Home Administration and through small watershed projects under Public Law 566.

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In addition to the "Report for Development of Water Resources in Appalachia", being prepared by the U. S. Army Corps of Engineers' Office of Appalachian Studies, the State is cooperating in comprehensive surveys of the Ohio River Basin and the Muskingum River Basin, also under the direction of the Corps. The U. S. Soil Conservation Service has also completed preliminary investigation reports on a number of small watersheds in the Appalachian Region.

Ohio has embarked upon a program to develop a Comprehensive State Water Plan, to be supported by five regional plans. Figure 2 shows the regional delineation for this planning effort and it may be noted that the Southeast and Central Regions embrace the bulk of Ohio Appalachia with a small portion contained in the Southwest Region.

The Northwest Plan has been completed and is now in the initial phase of implementation. More recently, studies have been initiated in the Northeast and Southwest Regions. The Southwest study is being undertaken in partnership with Federal and local groups and a similar arrangement is anticipated for the Central and Southeast Regions.

The State Water Plan, supported by the five regional plans, will be comprehensive in scope and will provide the basis for determining the State participation necessary to meet existing and projected water management needs and will outline those programs necessary to carry out the plan in partnership with Federal and local interests.

The Appalachian Region will not remain a separate identity in the State Water Plan, but will receive the full benefit of the comprehensive planning designed to fulfill Ohio's most urgent needs in water management, both immediate and long range.

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 9
PENNSYLVANIA WATER SUPPLEMENT

 $\begin{array}{c} \textbf{Prepared by} \\ \textbf{The Pennsylvania State Planning Board} \end{array}$

As Advisor to
The Secretary of Commerce
The Pennsylvania State Member
on the Appalachian Regional Commission

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CHAPTER 9 PENNSYLVANIA WATER SUPPLEMENT

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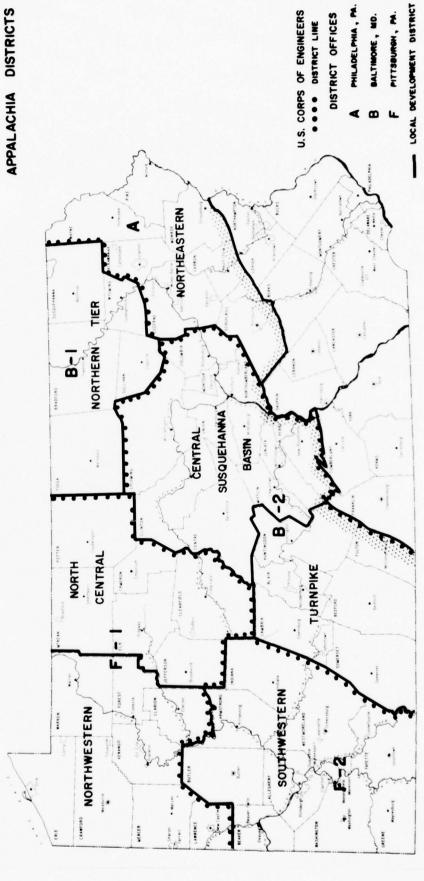
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INTRODUCTION

THE ACT AND THE SUPPLEMENT

Under Section 206 of the Appalachian Regional Development Act of 1965, the Secretary of the Army was "authorized and directed to prepare a comprehensive plan for the development and efficient utilization of the water and related resources of the Appalachian region, giving special attention to the need for an increase in the production of economic goods and services within the region as a means of expanding economic opportunities and thus enhancing the welfare of its people."

The Appalachian Act requires that the plan be submitted to the Appalachian Regional Commission for submission to the President who will submit the report, with his recommendations, to the Congress not later than December 31, 1968 (Sec. 206(d), P.L. 89-4).

As conceived and subsequently established, the Appalachian program is a partnership between the Appalachian States and the Federal government. It requires that the States exercise the primary responsibility for recommending projects for consideration by the Commission. Governors of the individual states are primarily responsible for developing investment policies and plans to govern the public investments made in the region under the Appalachian Act.

In the case of this water resources element being prepared under the aegis of the U.S. Army Corps of Engineers, this same goal of state participation was sought. Each of the states in the Appalachian region has been requested to summarize its contribution to the comprehensive plan of the Corps of Engineers in the form of a State Supplement. In Pennsylvania, the Secretary of Commerce, designated by Governor Shafer as the State Member of the Appalachian Regional Commission, requested the State Planning Board to take responsibility for the actual preparation of the Supplement.

In accepting this responsibility several objectives were agreed upon at the outset. First, the Supplement is to be keyed to the overall purpose of the Appalachian Act, with particular reference to the Water Resource Survey (Sec. 206). Second, it is to be harmonious with other Commonwealth development policies and constitute an integral part of the Appalachia Pennsylvania development program and its Plan for Public Investment. Third, programs and projects contributing to the overall development of Appalachia Pennsylvania will be recommended to Corps of Engineers and the Appalachian Regional Commission for consideration; and fourth, a framework for water and related resources planning after 1968 is to be evolved.

Elements to be considered in the Supplement's preparation include requirements for flood control and regulation of rivers to enhance their value as sources of water for industrial and municipal development,

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generation of hydroelectric power, prevention of pollution, development of recreational possibilities, improvement of navigation where economically required and achievement of soil and water conservation goals.

To assure coordination throughout the thirteen-state Appalachian region, the Corps of Engineers has proceeded with its study during the 1965-67 period and informed each of the State members of the Appalachian Regional Commission of its findings and progress. In Pennsylvania, supplemental, clarifying details of water planning efforts by state departments and political subdivisions have been supplied. Local Development Districts (see Map 1) have been instrumental in providing local information.

The principles of economic and social development were at the heart of the planning that went into this State Supplement. The first goal was to determine the extent (within each county) water resource problems retard, or might in the future retard, economic growth. Closely related was the second goal of determining how water resource development could alleviate economic problems and provide a stimulus for economic growth.

From this point of view specific information was sought about the economic potential that would be recovered from investments in flood control, pollution abatement or other projects, thus revealing where investments would produce the greatest economic return. Project recommendations were sought both from counties and Local Development Districts and from Commonwealth agencies with water resource development responsibilities.

Finally, a specific goal of the Appalachian water resources planning effort has been to determine how urban centers—the locations of most economic activity today—might be economically and socially benefitted by water resources projects.

Economic and social development, the foundation stones of the Appalachian Regional Development Act, have been at the heart of this water resources plan and have been the measure by which needs were evaluated and projects gauged.

CHROHOLOGY

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The sequence of events leading to this report are reviewed here to indicate the range of participation and the cooperation that made this supplement possible.

September 25, 1967 - Chairman and executive directors from the seven Appalachian Local Development Districts met in Harrisburg with officials of the Pennsylvania Department of Commerce, the State Planning Board and representatives from the Corps of Engineers to be acquainted with the scope of the Water Resources Report and to be familiarized with subjects to be covered in a questionnaire that would be sent to them soon.

September 28th - Officials from the Corps of Engineers met with staff members of the Department of Commerce and the State Planning Board to discuss the content and scope of the report. The Pennsylvania Supplement, they pointed out, should be completed by mid-January 1968, and to assure good coordination with the Corps of Engineers, they recommended the designation of a specific state agency and individual to be responsible for preparation of the Supplement.

October 6th - Questionnaries (see Appendix A) were sent to Local Development District representatives who were asked, in cooperation with the counties within each district, to survey each county within their development district and return answers by November 3rd. (Forty-nine of the 52 counties in Appalachia Pennsylvania replied to the questionnaire.)

October 18th - The Secretary of Commerce (State Member, Appalachian Regional Commission) sent a request to the State Planning Board asking that it be responsible for preparation of the State Supplement.

November 2nd - At the regular meeting of the Water Resources Coordinating Committee of State agencies, members were informed about the scope and timetable of the State Supplement and requested to supply answers to a questionnaire distributed to them (see Appendix B). Replies were requested by December 1st.

November and December - Meetings were held individually with Commonwealth agency representatives to identify each agency's water resources planning goals, to pinpoint the agency's criteria and standards of evaluation and to review the timetable for preparing the Supplement. During this same period, State Planning Board staff prepared background materials and maps necessary in the planning and evaluation processes.

- The Water Development Coordinating Committee for Appalachia held a meeting in Knoxville, Tennessee, to brief state officials on the form and content of state supplements. It was attended by the Pennsylvania Water Resources Coordinator, the State Alternate and other Commonwealth officials.
- An ad hoc committee of officials in state departments concerned with abatement of mine pollution met to find agreement on priorities among several proposed projects. From that meeting a consensus of the most important projects was agreed upon.

December 22nd - After receiving a progress report from the State Planning Board staff, the Secretary of Commerce decided to call a meeting to discuss proposed project priorities with Cabinet members and directors of State agencies involved in water resources activities.

December 28th - A special meeting of the State Planning Board was held during which progress on the Supplement was reviewed and approved. The staff was instructed to continue working closely with all agencies involved

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in water resources planning, and the Board called attention to the need for review of long-range state policy on water resources in Appalachia.

January 3, 1968 - Executive Directors from the Local Development Districts met with staff members from the State Planning Board and the Departments of Commerce and Forests and Waters to discuss questionnaire replies received from Local Development Districts, Port Authorities and Commonwealth agencies, information received from the Corps of Engineers, the Soil Conservation Service and the Bureau of Outdoor Recreation, and to get reactions to projects proposed by these agencies. General agreement was achieved about the importance of these agency proposals, use of the principles of the Appalachian Regional Development Act as the standard of evaluation, and the State Planning Board staff decision to prepare two lists of water resources projects, the first containing emergency and top priority recommendations, and the second containing all projects submitted by local, state or Federal agencies.

January 4th - State Planning Board staff presented a report of its work to the Water Resources Coordinating Committee, including a suggested list of top priority projects as received from various Commonwealth agencies. Discussion by the Committee led to unanimous approval of a list of projects.

January 5th - Secretary of Commerce convened a meeting of Cabinet officials and their principal staff members concerned with water resources activities in the Briefing Room of the State Planning Board. Unanimous agreement was reached on the emergency and high priority projects—seventeen in all—which should be included in the State Supplement. Since many of these projects are multi-purpose and therefore affect several agencies at once, this agreement was felt to be most necessary.

February 1st - State Planning Board staff presented a report to the Water Resources Coordinating Committee, including information on the seventeen emergency and top priority projects.

February 2nd - A list of projects recommended by the meeting of Cabinet officials was submitted to the State Planning Board for approval. The approved projects and their justifications were incorporated in the report which was transmitted to the Secretary of Commerce for subsequent submission to the Corps of Engineers as the State Supplement.

METHODOLOGY AND ORGANIZATION OF THE SUPPLEMENT

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The philosophy of the Appalachian Act and the Commonwealth's objectives for Appalachia controlled the concept underlying the Supplement and the system in its preparations.

The strategy for development of the report included the following essentials:

1. Identification of the general water resources planning goals;

- 2. Formulation of the special Appalachian Pennsylvania water resources planning objectives;
- 3. Establishment of criteria to qualify and evaluate projects;
- 4. Justification of projects for which authorization will be sought as part of the Supplement; and,
- 5. Formulation of a strategy for continuity and coordination of water resources planning.

CREDITS AND RESPONSIBILITY

This Supplement has been prepared by the staff of the Pennsylvania State Planning Board, but it would have been an impossible task without cooperation and assistance received from many people, especially in the following agencies:

State Water Resources Coordinating Committee;

State Departments of:

Agriculture, Commerce, Community Affairs, Forests and Waters, Health, Highways, Internal Affairs - Geological Survey, Mines and Mineral Industries;

Commissions:

Fish Commission, Game Commission;

Port Authorities:

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Erie Port Commission and Port Authority of Allegheny County;
Appalachian Regional Commission;

- U.S. Army Corps of Engineers, Office of Appalachian Studies;
- U.S. Department of Interior. Bureau of Outdoor Recreation.

SUMMARY OF THE STATE SUPPLEMENT. APPALACHIAN WATER RESOURCES PLAN

1. The Congress directed the Secretary of the Army to prepare a comprehensive plan for the development of water resources in Appalachia. Special attention was to be given to means of expanding economic opportunities and enhancing the welfare of the people within the Appalachian region.

- 2. This directive (as contained in the Appalachian Regional Development Act of 1965) has been carried out by the U.S. Army Corps of Engineers which has sought information and cooperation of the thirteen states in the Appalachian region.
- 3. Each state was requested to prepare a "supplement" to the Corps of Engineers report, this supplement to contain views of the states about the most pressing water resource problems and potentials as seen by state and local officials, and to recommend the most needed projects.
- 4. The Secretary of Commerce, the official designated by Governor Shafer as the State Member for Pennsylvania on the Appalachian Regional Commission, asked the State Planning Board to prepare this Supplement.
- 5. A review of recent social and economic trends in Appalachia Pennsylvania illustrates a past dependence on heavy industries and agriculture; their economic readjustment reflecting serious employment and population losses.
- 6. The land of Appalachia is mountainous and drained by three major river systems. Of these, the Susquehanna River and Ohio River are the most important to Appalachia, containing substantial amounts of mine acid and other pollutants at certain points.
- 7. The Commonwealth of Pennsylvania, in cooperation with the Appalachian Regional Commission, is engaged in comprehensive economic development planning for Appalachia Pennsylvania. In June 1967, A Plan for Public Investment in Appalachia Pennsylvania was prepared, emphasizing new sources of employment, improvement of skills and capabilities of the work force, and upgrading the urban environment.
- 8. Water resources planning and development is considered to be integral to such economic development.
- 9. At the same time, water resources planning is subject to a wide range of Commonwealth policies ranging over many subjects such as pollution, water supply, navigation, recreation, and conservation. These policies and economic development goals formed the basis for this Supplement's recommendations.
- 10. Commonwealth agencies concerned with water resources, and Local Development District and county officials were surveyed for information about needed water resource projects and their expected economic impact. Over 230 projects were received.
- ll. The resulting list was screened by State Planning Board staff and was discussed with the Commonwealth's Water Resources Coordinating Committee. A final list was agreed upon.

12. Cabinet officials from State agencies concerned with water resources development met in the State Planning Board offices on January 5, 1968 and agreed unanimously to recommend the following seventeen projects:

RECOMMENDED PROJECTS

Emergency Project

A. Lackawanna River and Susquehanna River Mine Drainage Abatement, Subsidence Prevention and Flood Protection

Abatement of mine drainage pollution (pumps, treatment works, land reclamation, and restoration), mine flushing and grouting.

Estimated cost: \$68.2 million.

Top Priority Projects

B. Sewickley Creek Watershed -- Flood Protection and Water Supply

Retarding structures on streams and channel improvement to provide floodwater protection and industrial water supply for industries between Greensburg and Youngwood. (P.L. #566 Project)

Estimated cost: \$3,528,800.

C. Otocsin Reservoir and Recreation Area

Construction of reservoir in major tourist and recreation areas; undertaking of project to be coordinated with City of DuBois by the Department of Forests and Waters.

Estimated cost: \$29 million including private investment.

Reservoir public investment \$3 million.

D. Sechler's Run Flood Protection

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Flood control project on Sechler's Run; to protect industrial and commercial areas of Danville.

Estimated cost: \$1,150,000.

E. Clarion River Basin Mine Drainage Abatement

Mine drainage abatement work in the Clarion River Basin, to restore water quality in Clarion River and its major tributaries.

Estimated cost: \$60 million.

F. Casselman River Mine Drainage Abatement

1. Abatement of mine drainage to restore fish and aquatic life in the Casselman and Youghiogheny Rivers and to protect the recreational use of Ohiopyle State Park, the first step toward the complete abatement of mine drainage in the Youghiogheny River Basin.

Estimated cost: \$5 to 7 million.

- 2. Further locational and engineering study of the U.S. Army Corps of Engineers, proposed multi-purpose reservoir, Upper Casselman River.
- G. Upper West Branch Susquehanna River Mine Drainage Abatement

Corrective work to protect the water quality of the Curwensville Reservoir and a first step towards complete abatement of mine drainage in the West Branch Basin.

Estimated cost: \$7.7 million.

H. Connoquenessing Creek Watershed--Flood Control, Water Supply, Recreation.

Flood prevention, water supply and recreation project; to benefit West Central Butler County, including Butler and Zelienople. (P.L. #566 project)

Estimated cost: \$14,637,300.

I. Raccoon Creek Reservoir

U.S. Army Corps of Engineers multi-purpose reservoir, adjacent to Raccoon Creek State Park; flood control, water quality, water supply, recreation.

Estimated cost, including acid stream and strip mine reclamation: \$35 million.

J. Port of Erie Dredging

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Dredging of West Bay Area and proper disposal of dredged material.

Estimated cost: \$2 million.

K. Naturealm Conservation -- Education Area

Development of water-related improvements and facilities at an existing reservoir; to provide a conservation education area.

Estimated cost: \$9.5 million.

L. Abrahams Creek Flood Protection

Local flood protection; levee and channel improvements to alleviate flooding of industrial and commercial areas in Wyoming and West Wyoming in Luzerne County.

Estimated cost: \$500,000.

M. Sam's Run Flood Protection

Repair and extension of channel improvements on Sam's Run in Johnstown and Lorain Borough; to protect residential and industrial areas.

Estimated cost: \$320,000.

N. Big Sandy Creek Reservoir

U.S. Army Corps of Engineers multi-purpose reservoir; final location and design of project to be coordinated between the Corps of Engineers and the Department of Forests and Waters.

Estimated cost, including recreation facilities: \$25 million.

O. Upper Loyalhanna Creek Watershed -- Flood Control, Water Supply, Recreation.

Flood control, recreation and water supply project; to benefit Eastern Westmoreland County, including Ligonier-Latrobe area. (P.L. #566 Project)

Estimated cost: \$7,621,400.

P. Tioga-Hammond Reservoir and Mine Drainage Abatement

U.S. Army Corps of Engineers reservoir project, flood control and recreation purposes; project already authorized; acceleration urgent. Also, abatement of mine drainage pollution in watershed is needed.

Estimated cost: reservoir construction: \$57.5 million. pollution abatement: 7.25 million.

Q. Stony Creek Watershed -- Flood Control and Recreation

Flood control and recreation project to benefit Hooversville and Blough communities, alleviate annually recurring damage to railroad facilities. (P.L. #566 project)

Estimated cost: \$7,851,260.

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CONTINUED WATER RESOURCES PLANNING

These project recommendations are made based on the criteria and evaluations presented in this report.

The project submittals of the several State agencies and the Local Development Districts warrant every consideration, further indicating the relevance of continued comprehensive water resources planning.

The projects not included in the foregoing recommendations will be made the subject of continued study, in the effort to evaluate more completely their need and disposition. Projects proposed by Local Development Districts will be reviewed with the appropriate State agency (or agencies) as to their possible undertaking, consistent with the criteria that a project, to be undertaken, must have the recommendation of the State agency whose principal responsibility is involved.

This continuing activity will proceed within the context of the State Planning Program of the State Planning Board in the annual review, revision and preparation of the Appalachian Pennsylvania State Development Plan and the formulation of the Comprehensive State Development plan. In this work, participation will be sought of the principal State agencies concerned, including the Department of Forests and Waters, Department of Commerce, Department of Health, Department of Highways, Department of Community Affairs, Department of Mines and Mineral Industries, Department of Agriculture, Department of Internal Affairs, Fish Commission and Game Commission. Federal agencies such as the U.S. Army Corps of Engineers, Bureau of Outdoor Recreation and Federal Water Pollution Control Agency will be contacted on a continuing basis.

Relevant to that effort, it is felt that the following projects should receive particular attention:

- R. -further study of the construction of a multi-purpose reservoir proposed by the U.S. Army Corps of Engineers, on the Clarion River, near <u>St. Petersburg</u> in Clarion County, including the consideration of the total impact and effect of this reservoir;
- S. -study of the proposed reservoir and recreation facility U.S. Army Corps of Engineers, on Wapwallopen Creek, in Luzerne County;
- T. -study of the proposed reservoir and recreation facility U.S. Army Corps of Engineers, on Meshoppen Creek, in Wyoming County.

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SECTION I - APPALACHIA PENNSYLVANIA

Appalachia Pennsylvania covers over three-quarters of the Commonwealth. Commencing at Blue Mountain, the forested mountain ridge that swings across Pennsylvania from the northeast to southwest, Appalachia Pennsylvania extends westward and northward to include the rest of the State. Fifty-two of Pennsylvania's sixty-seven counties and 52 percent of the State's population are found in this region.

Appalachia Pennsylvania suffers in various sections from poor transportation connections, water pollution, spoilation of the countryside, low income, low levels of educational attainment, and unemployment rates higher than the rest of the State. If these conditions continue, Appalachia Pennsylvania will soon have fewer people than Megalopolis Pennsylvania—the fifteen-county south-eastern quarter where most of the State's population growth occurred between 1950 and 1960.

Table 1
Pennsylvania's Population Growth
1950 - 1960

Region	1950	1960	Gain
Appalachia	5,784,652	5,930,784	146,132
Megalopolis	4,713,360	5,388,582	675,222
Pennsylvania	10,498,012	11,319,366	821,354

Source: U.S. Bureau of the Census

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In 1950, Appalachia Pennsylvania and Megalopolis Pennsylvania contained 55% and 45%, respectively, of the total State's population. By 1960, however, Megalopolis Pennsylvania contained 48% of the State's population--3% over its share in 1950. During the same period Appalachia Pennsylvania experienced only 18% of the State's population gain. For Appalachia Pennsylvania to achieve its proportion of State growth, its communities must be made more competitive with others in the Nation. New public facilities -schools, highways, hospitals and the like--will be needed, but in many cases will be expensive because of the rugged terrain and because of damaging effects of the once flourishing coal mining industry. Still, many investments in people, communities and resources are needed to draw new growth and offset employment losses of mining, railroading and steel manufacturing, traditionally the region's largest employers. If Appalachia Pennsylvania can develop an industrial composition similar to the national mixture, it would then be in a better position to share in the growth of the State and the Nation.

1. PHYSIOGRAPHIC DESCRIPTION

In spite of the physical and economic problems of Appalachia Pennsylvania, existing resources in the area offer a base for expanded employment. Nature has been good to Pennsylvania. The fertile southeastern Piedmont Plateau and Coastal Plain areas which lie outside Appalachia (see Map 2), are backed up by a vast central region of mountains, forests and rivers dominated by the broad Susquehanna River watershed.

Moving westward, the Appalachian Mountains reach the rugged Appalachian Plateau which has exerted its influence on the region. Major portions of this Plateau are drained by the Ohio, Susquehanna and Delaware watersheds. In many cases urban development, including initial industrial growth, took place in the river valleys resulting in floods in many of these places during periods of high river flows.

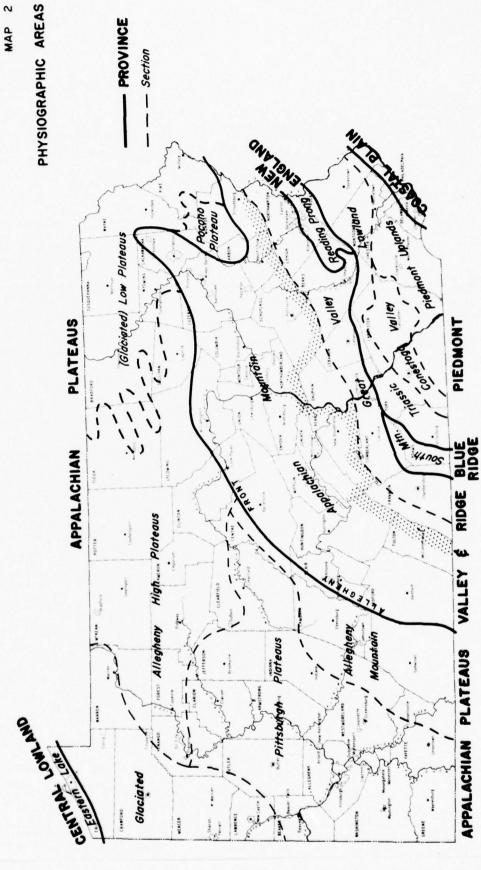
Finally, moving farther westward and northward, the Central Lowlands slope to Lake Erie, providing a gateway to the shipping lanes of the Great Lakes and St. Lawrence Seaway.

a. Rivers. Map 3 shows the watersheds of Appalachia Pennsylvania. The three major river basins, from east to west, which pass through Appalachia are the Delaware, Susquehanna and Ohio. The Potomac and Genesee river basins and Lake Erie watershed cover smaller portions of Appalachia Pennsylvania. These watersheds represent a heritage of water resource developments and offer the opportunity to improve Appalachia Pennsylvania economically and socially—in terms of new employment, new income, and a more pleasant working and living environment.

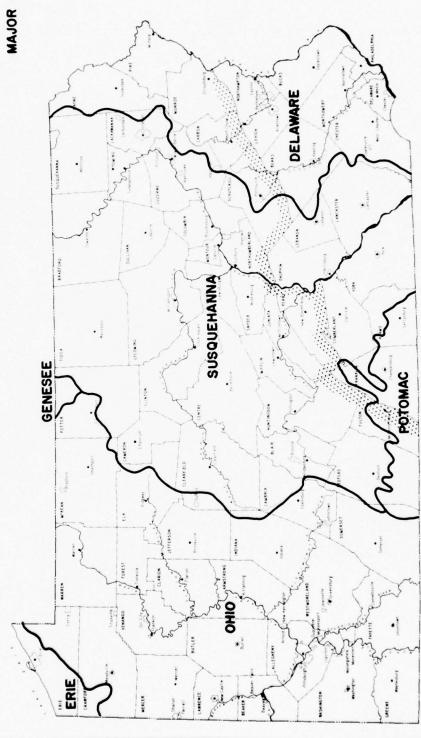
The Delaware River extends from the Catskills in New York State to the Atlantic Ocean, draining a long, narrow basin 40 to 80 miles wide. It has cut a deep gorge through the Catskills and the Appalachian Plateaus Province in New York State and then flows down broad Appalachian valleys. At Delaware Water Gap it pierces nearly vertical sandstone walls and passes on through scenic farm and forest land. For 150 miles--from Hancock, New York, to the Delaware State Line -- it forms the eastern boundary of Pennsylvania, and within the State it drains 6,442 square miles, approximately a third of which is within Appalachia. The Delaware River Basin Commission (DRBC) has been established to oversee the comprehensive development of the basin's water resources, and of particular intent to the Delaware River Basin Commission is the Tocks Island Reservoir and the surrounding Delaware Water Gap National Recreation Area. These projects are expected to spur the tourist business of Monroe and Pike Counties which are at the eastern edge of Appalachia Pennsylvania. At least three additional major water control projects in the Commission's plan for development also lie in Appalachian counties of Pennsylvania as do numerous smaller projects.

Along the main stem of the Delaware, the problems and potentials are different from those along the Lehigh and Schuylkill, which are tributaries of the Delaware and have suffered from municipal and industrial

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pollution. Much of this pollution occurs after the streams break through Blue Mountain, leaving Appalachian counties to the north, although significant pollution from anthracite mining occurs around their headwaters in Schuylkill and Carbon Counties. On the main stem of the Delaware, the water quality is remarkably high north of Easton and is therefore sought by eastern seaboard cities whose increasing demands require them to search far and wide for new supplies. In part, the inevitable competition of New York, New Jersey and Pennsylvania cities brought about the Delaware River Basin Commission whose responsibility it is to regulate use of basin's water supplies, clean up existing sources of pollution and develop the abundant recreation and economic resources of the river basin.

The <u>Susquehanna</u> is the longest river draining into the Atlantic Ocean, rising in Ostego Lake in central New York. It dips into the north portion of Susquehanna County (Pennsylvania), and back into New York before it finally bends southward through Bradford County. It flows to the southeast through the Allegheny Plateau and breaks into the Ridge and Valley province of the Newer Appalachian Mountains at Pittston where it is joined by the Lackawanna River from the northeast. From there, following a longitudinal valley, it moves southwesterly to Sunbury where it is joined by the 228 mile long West Branch which rises in the Appalachian Plateau country of northern Indiana County. From Sunbury, it flows south until it is joined by the Juniata River flowing from the west through the Ridge and Valley province. Just below this confluence it cuts through Blue Mountain near Harrisburg and emerges in an impressive mile-wide bed that moves southeasterly to the Chesapeake Bay and on to the Atlantic Ocean.

During the 1825-40 canal era of Pennsylvania, the Susquehanna and its tributaries were the routes of canals from Harrisburg west across the mountains along the Juniata, north and west along the West Branch of the Susquehanna to Lock Haven in Clinton County, and northeast to Wilkes-Barre and on up to Towanda in Bradford County. Along the Juniata, iron was produced in charcoal fired furnaces; to the north along the West Branch, lumbering was the principal industry; and along the Wyoming Valley, traversed by the North Branch, anthracite mining was the dominant industry for over a hundred years.

The legacy of anthracite mining in the deep mines of the Lackawanna and Wyoming Valleys from Carbondale to Nanticoke is a yearly contribution of acid mine water. As mines have been abandoned they have filled with ground water ultimately overflowing into adjacent mines or into the Susquehanna and its tributaries. Pumping waters from these abandoned pools was necessary to continue operations in some active mines and resulted in serious pollution in 1961. By 1966, it was reported in the Susquehanna River Basin Report Mineral Industry Water Requirements and Waste Water that the four anthracite fields contribute 1,088,100 tons of "sulfuric acid equivalent," 103,800 tons of iron, and 11,900 tons of manganese to the Susquehanna River system annually. A report from the Division of Sanitary Engineering of the Pennsylvania Department of Health

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revealed that between 1940 and 1960 "although there has been no significant change in the volume of mine drainage entering the river from the Wyoming region, the amount of acid entering the river has more than doubled."

The West Branch of the Susquehanna is also beset with acid drainage—this from bituminous mining operations occurring around its headwaters in Cambria, Indiana, Centre and Clearfield Counties. The West Branch above Lock Haven has a 3,337 square mile watershed containing at least 4,351 active and abandoned mines. These discharge 1,959 tons of "sulfuric acid equivalent" into the river daily. At Lock Haven the acid water of the West Branch is joined by the alkaline flow of Bald Eagle Creek bringing about a neutralizing balance so that below this point, the river is usually non-acid and contain aquatic life, including fish.

Fish kills occur, unfortunately, when rain storms in the upper reaches of the West Branch increase the acid flow in proportion to the volume of alkaline water coming from Bald Eagle Creek and other downstream tributaries. Damage to fish and other aquatic life from these "acid slugs" often extends downstream to Williamsport and occasionally as far down as Sunbury.

The headwaters of the Tioga River, a tributary of the North Branch which drains parts of Tioga and Potter Counties, are also contaminated by bituminous mine drainage. The pollution extends about 20 miles downstream before natural river flows dilute and neutralize it.

On the Juniata a few small tributary streams on the Raystown and Frankstown branches are polluted. Five hundred and forty-six active and abandoned mines have been spotted on these two tributaries, and they contribute 112 tons of sulfuric acid equivalent to the river system daily.

The Ohio River Basin in Pennsylvania covers 15,600 square miles of the western part of the State and is comprised of three major tributaries—the Allegheny, Monongahela and Beaver Rivers. The Allegheny rises in Potter County, turns northward into western New York State before flowing in a southwesterly direction in a deep v-shaped bed through the Appalachian Plateau to Pittsburgh. There it joins the Monongahela (which flows from West Virginia) to form the Ohio River. About 25 miles downstream from Pittsburgh, the Ohio is joined by the Beaver River which drains a 3,100 square mile section of eastern Ohio and Northwestern Pennsylvania.

The Allegheny River contains generally good quality water in its upper reaches although oil production in Warren and Venango Counties has led to pollution by brines and other oil field wastes. Farther downstream mine acid pollution from the Kiskiminetas River (fed by the Conemaugh and Little Conemaugh Rivers, Loyalhanna and Blacklick Creeks) is a major source of the Allegheny's pollution and has caused numerous fish kills below Freeport. Upstream from the Kiskiminetas other tributaries made acid by drainage resulting from bituminous mining activity are Crooked, Cowanshannock,

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Mahoning and Red Bank Creeks and the Clarion River. The latter also has organic pollution caused by wastes from tanneries and a paper mill.

The Allegheny is navigable into northern Armstrong County 72 miles above Pittsburgh although river traffic (5 million tons in 1964) is confined largely to movement of coal and sand and gravel. Both navigation and flood control works have been constructed along it to reduce the ravages of floods and protect life and property located along the narrow valley beside it. The worst flood occurred in March 1936, and although total protection from such floods is probably not economically feasible, reservoirs on East Branch Clarion, Tionesta Creek, Mahoning Creek, Crooked Creek, the Conemaugh River and Loyalhanna Creek effectively control 24 percent of the drainage. The just completed Allegheny Reservoir above Warren and the planned Muddy Creek, Union City and Woodcock Creek Reservoirs in the French Creek Basin will control an additional 21 percent of the Allegheny's drainage.

The Monongahela is formed by the confluence of the West Fork and Tygart Rivers at Fairmont, West Virginia, from which it flows northward 120 miles to Pittsburgh, draining 2,730 square miles in Pennsylvania. As with the Allegheny, it carves a deep valley through the Appalachian Plateaus province, an area of rugged terrain with deep, narrow valleys and few flat places save those in flood plains, occasional terraces and flat-topped hills.

The Monongahela is navigable throughout its length, plus two miles up the Tygart River at Fairmont, West Virginia, and its traffic (37.5 million tons in 1964) is comprised mostly of coal and coke.

As with the Allegheny, the worst flood on the Monongahela occurred in March 1936, and were it not for construction of control works since then, a similar flood today would cause an estimated \$69.5 million in damage and inundate 13,000 acres. Now, reservoirs on the Youghiogheny and Tygart Rivers control 22 percent of the drainage. Several projects are in various stages of planning to bring a larger portion of the basin's waters under control.

Because it drains bituminous coal fields that have been mined for over a century, the Monongahela has the dubious distinction of being the most acid of all the twenty-two sub-basins in the Ohio River system. Most of this acidity comes from small tributary streams joining the Monongahela between Fairmont, West Virginia and Pittsburgh. (Within this area only an estimated one-tenth of the coal reserves have yet been mined.) Although mine drainage is the most serious problem, organic wastes are also significant throughout this industrial valley.

The Beaver River is smaller than either the Allegheny or Monongahela and is not navigable. It is formed near New Castle where the Shenango and Mahoning Rivers converge. The Mahoning rises in Ohio and passes Youngstown in a southeasterly direction while the Shenango rises in northwestern Pennsylvania and flows to the Ohio border before turning to the south. It traverses Appalachian Plateau country much of which has been transformed

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by continental ice sheets which rounded hills and filled valleys with glacial sediments.

Reservoirs on both branches have been constructed which, together with others in the planning stages, will control a third of the drainage. Two important flood problems exist at Youngstown, Ohio, and at New Castle and will require channel improvements.

The waters in their natural state are primarily hard and changes in chemical composition result from domestic and industrial wastes which keep the river slightly acid. Industrial discharges often cause thermal pollution by returning heated water to the stream thereby causing a loss of oxygen content necessary to support aquatic life.

b. Other Physical Features

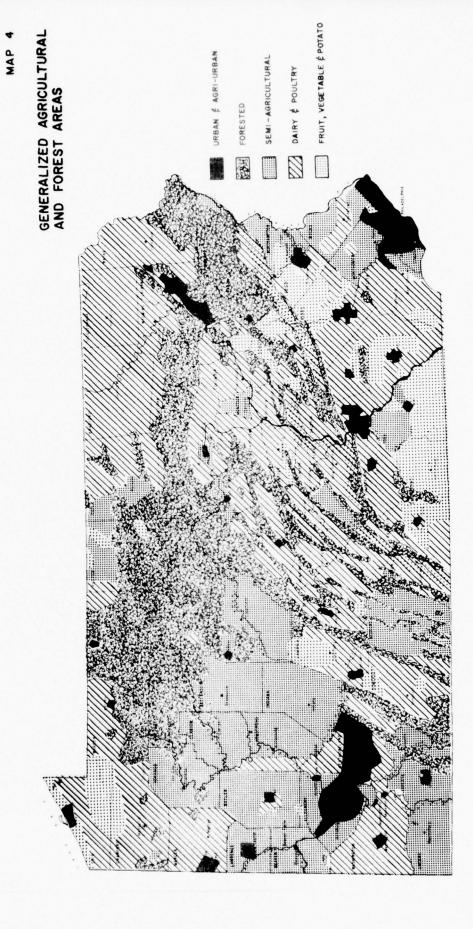
Map 4 depicts the large agricultural areas of the State. Since prime farmlands in Megalopolis Pennsylvania are rapidly being subdivided for residential and commercial use, more emphasis in the future must be placed on the agricultural areas of Appalachia Pennsylvania. Because irrigation of crops will play an increasing role in the future, this type of water use will require larger amounts of water to meet such needs. Map 4 also shows the broad expanses of central Pennsylvania covered with forests which not only supply forest-based industries with raw material but also afford many excellent sites for water-related recreational facilities to be built.

Another significant aspect of the natural resources of Appalachia is the abundance of sub-surface mineral resources—coal, gas, and oil—which are distributed within the State as shown on Map 5. Not shown here are such resources as limestone, clay, sand and other extractive elements which have furnished important raw materials for the industrial development of Pennsylvania. Today these raw materials play a lesser role in the State's economy than in the past, although they are a reserve of fuel and a source of industrial raw materials. And just as in the past, their use is a challenge to the surrounding environment which has often suffered as mining prospered. The evidence has been found in the State's rivers and streams. Now there is an awareness by business and the public that balanced development of minerals and water resources is a necessity for economic progress.

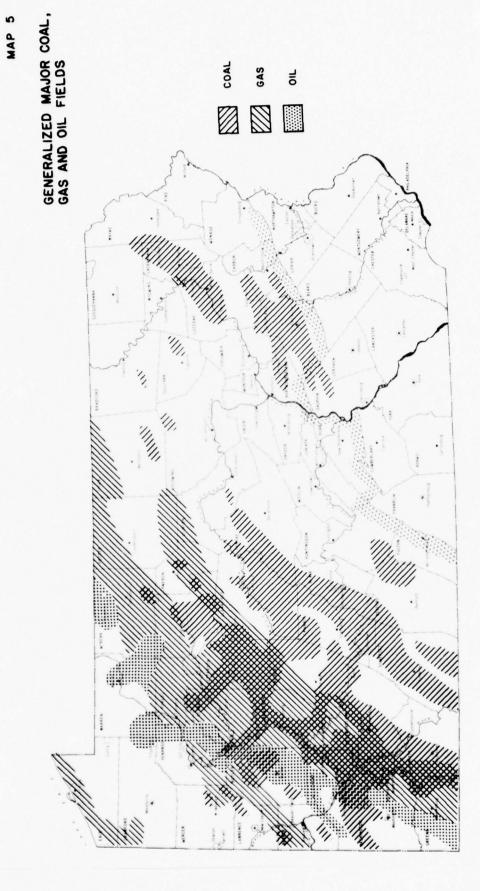
2. SOCIO-ECONOMIC PROFILE

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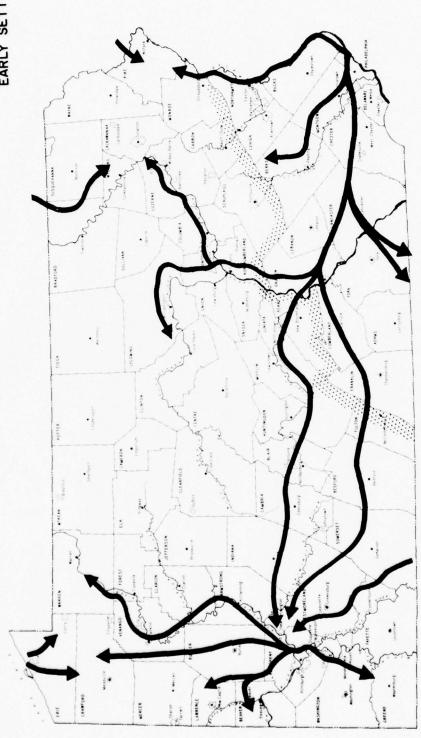
As stated previously, poor access to much of Appalachia Pennsylvania has contributed toward its slow growth. Some parts, of course, were served by early roads. Map 6 shows diagrammatically the early trade and travel routes which later canals, railroads and highways followed. Due to the rugged terrain of central Pennsylvania, it was much easier to reach Western Pennsylvania from Philadelphia by swinging south from Lancaster to the Cumberland Trail to Pittsburgh instead of crossing the mountains. It was, therefore, quite natural that western Pennsylvania would initially be

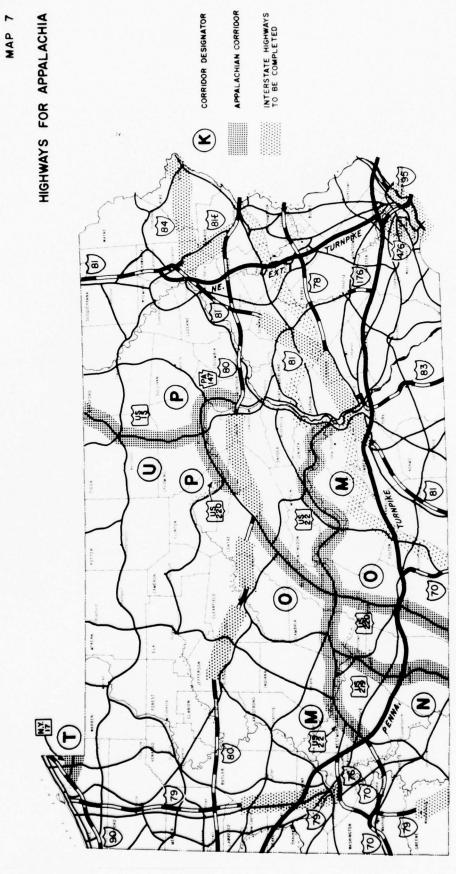


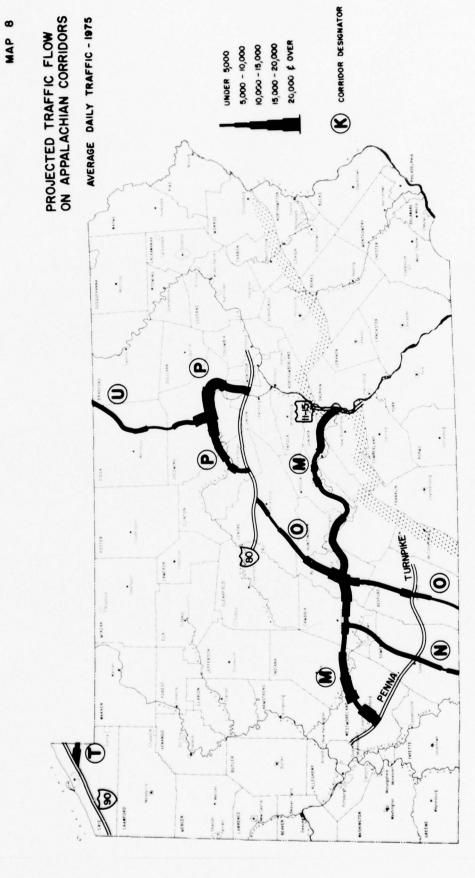
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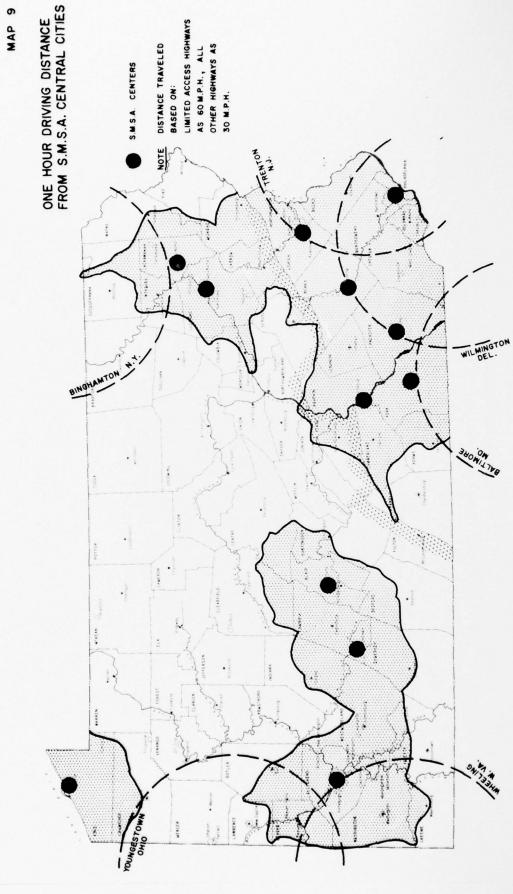
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influenced by a predominance of settlers and traders from Virginia and Maryland. Similarly, the northern tier counties (Tioga, Bradford and Susquehanna) were partially settled by New Englanders that found easier access into this portion of the State from the north than did the Philadelphians from the south. The Dutch from their settlement at New Amsterdam (New York) were able to penetrate far enough into the Poconos Mountain area of Pennsylvania to leave a legacy of Dutch named streams or "Kills" that serve as a reminder of their once prominent position here.

As shown on Maps 7 and 8 Appalachia Corridors—high-speed highways—are planned that will improve highway access throughout Appalachia. These will be of particular benefit to Johnstown, Altoona and Williamsport, urban centers in the center of Appalachia Pennsylvania which have been bypassed by transportation improvements in the recent past. Scranton and Wilkes-Barre enjoy excellent access to the urban centers around them, due to planned and constructed interstate highways. As additional highways are completed, a large portion of Appalachia will be served by high-speed limited-access roads. When all Appalachia corridors and interstate highways are completed, persons living in most Appalachia counties will be able to drive to one of the interstate highways in a half hour or less time.

Map 9 presents another view of access within the State. It shows the distance an auto can travel within one hour on various roads from central cities of the State's twelve metropolitan centers. The primary assumption of this analysis is that most persons will not travel more than one hour's driving distance to go to work or to reach intensively developed recreation areas. Also shown on this Map are the one-hour travel time radii centered on Binghamton, New York; Youngstown, Ohio; Wheeling, West Virginia; Trenton, New Jersey; Baltimore, Maryland; and Wilmington, Delaware, metropolitan centers that extend into Pennsylvania.

The configurations produced by the one-hour driving distances from each of the twelve centers produce an overall pattern for the State as a whole, indicating the areas where employees can live and still find employment within one of the central cities if they are willing to spend a relatively short time for commuting. In addition, the five metropolitan centers which lie beyond the State's borders also play a significant role since these "near neighbors" may seek water-oriented economic investments and recreational opportunities in Pennsylvania within an hour's driving time. Considering the overall pattern shown on Map 9, it can be seen that one strong east-west corridor of one hour's commuting distance develops from Philadelphia to Pittsburgh, and two others are found, having a north-south orientation, in the eastern and western ends of the State.

On Map 10, the 1960 State's population distribution is plotted (by local political subdivision boundaries) and shows densities of 300 to over 1000 persons per square mile. It highlights the three major urban complexes of Appalachia Pennsylvania--Pittsburgh, Scranton-Wilkes-Barre and Erie. The largest, the Pittsburgh urban belt, extends from Fayette County through Beaver County, to connect with the Youngstown urban area. This

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urban area constitutes an important part of the steel manufacturing belt which extends all the way to Lake Erie in Ohio. Next in size is the urban concentration found in northeastern Appalachia Pennsylvania—the Wilkes-Barre-Scranton area, characterized by the urbanization along the Wyoming and Lackawanna Valleys, where anthracite coal was once extensively mined. A third major area is found along the waterfront around Erie, extending from the Ohio to New York State lines.

Though smaller than the above-mentioned complexes, Altoona and Johnstown are significant urban centers and are classified as standard metropolitan statistical areas. They are located in Blair and Cambria Counties, respectively. Williamsport in Lycoming County is northeast of Altoona. To the west, the New Castle and Sharon-Farrell urban areas form links in the Pittsburgh-Youngstown urban belt. Throughout the remaining sparsely developed central Pennsylvania area, widely dispersed small towns and cities predominate.

Map 10 emphasizes the fact that Pennsylvania is a highly urbanized State. The 1960 Census places the State of Pennsylvania as the seventh most densely populated State in the Nation. In short, Pennsylvania is a highly urbanized industrial State. The concentration of population in different sections of Appalachia influences the nature and location of water resources development needs and the selection of projects to meet these needs.

Of importance too in selecting projects for water resources development is the identification of the location of Appalachia Pennsylvania's employment centers. Map 11 shows manufacturing employment centers providing 500 to over 4000 jobs (by political subdivision). These employment centers deserve prime consideration in pollution abatement, flood control, and other water resources projects, pertinent to the needs of existing or prospective businesses.

Area employment growth also serves as a guide for investment in those areas which already show growth potential. Taken as a whole, Appalachia Pennsylvania experienced a growth of 139,100 jobs between 1960 and 1966, while its unemployment rate dropped from 10% to 4%. Assuming an unemployment level of approximately 3% as signifying full employment, it will be observed from Table 2 that adjustments must be made (either by continuing out-migration, the creation of new jobs or both) to achieve this standard in the Southwestern, Turnpike, North Central and Northern Tier Local Development Districts. As viewed on Table 2, each of the Appalachia Local Development Districts of Pennsylvania experienced a decline in unemployment between 1960 and 1966. At the same time, the Southwestern, Turnpike, North Central, and Northeastern Districts experienced a decline in total civilian work force as well. These civilian work force declines, of course, contributed toward the reduction in unemployment rates as shown on Table 2. All of the Districts showed extensive net out-migration between 1960 and 1965 with the greatest out-migration occurring in the Southwestern District. The population trends for each of the Districts (shown on Table 3) reflect partial adjustments in net migration and

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TABLE 2
EMPLOYMENT - WORK FORCE
TRENDS
1960-1966

District	Civilian Work Force (thousands)	n W ork ce ands) 1966	Total Employment (thousands	Total Employment (thousands)	Total Unemployment (thousands)	al yment ands) 1966	Unemployment Rate (percent)	yment e ent) 1966
Northwestern	254.9	266.6	232.0	258.8	22.9	7.8	9.3%	2.9%
Southwestern	1,094.2	1,077.8	6.066	1,043.6	103.3	34.2	9.4%	3.2%
Turnpike	175.7	173.9	155.1	164.5	20.6	9.4	11.7%	5.4%
North Central	93.4	92.3	84.4	88.5	0.6	3.8	9.6%	4.1%
Northern Tier	49.7	50.9	45.3	49.0	4.4	1.9	8.9%	3.7%
Northeastern	352.1	347.3	310.1	331.0	32.0	10.3	9.1%	3.0%
Central Susquehanna Basin	196.0	212.6	180.5	206.0	14.5	9.9	7.4%	3.1%
Appalachia Total	2,233.2	2,233.4 2,014.0	2,014.0	2,153.1	219.2	80.3	9.8%	3.6%

Source: Pennsylvania Department of Labor and Industry, Bureau of Employment Security, April 1967.

TABLE 3
LOCAL DEVELOPMENT DISTRICT
POPULATION TRENDS 1960 - 1965

Northwestern 721,892 Southwestern 2,883,728 Turnpike 510,508	1960 (1)	Estimated Population 1965 (2)	Population Change 1960-1965	Net Migration 1960-1965 (2)	Population Percentage Change 1960-1965	Population Shift 1960-1965
	,892	726,100	4,208	- 31,289	9.0	24.0%
	,728	2,840,300	-43,428	-173,728	-1.5	-95.4%
	, 508	503,400	- 7,108	- 26,749	-1.4	- 4.6%
North Central 244,240	,240	241,800	- 2,440	- 14,757	-1.0	- 0.4%
Northern Tier 147,740	,740	144,800	- 2,940	- 10,797	-2.0	- 4.2%
Northeastern 884,381	,381	883,100	- 1,281	- 15,744	-0.2	21.9%
Central Susquehanna Basin 538,293	,293	557,500	19,207	- 8,871	3.6	. 54 %
Total Appalachia Pennsylvania 5,930,782	,782	5,897,000	-31,220	-281,935	9.0-	100.0

Sources:

1960 Census of Population State Planning Board Staff Working Paper, Population Estimate 1965, Pennsylvania Counties, December 1967. (Z)

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MAP 13

District population change from 1960 to 1965. Even though they experienced some net out-migration, the Central Susquehanna Basin and Northwestern Districts increased in total population, making them the only Districts in Appalachia Pennsylvania that grew during this period.

The preceding discussion has centered on absolute employment and population figures and comparison of Appalachia Pennsylvania and its Local Development Districts with the rest of the State. Another method of examining the gains or losses of development districts in Appalachia Pennsylvania, relative to the development districts among themselves or Appalachia Pennsylvania as a whole, is the "shift" (see Map 12). The shift technique compares the observed change in a development district or county to the change that would have occurred if each area under study changed at exactly the same rate observed in 1960-1965 for Appalachia Pennsylvania as a whole: the latter is called the expected change. The shift for each Local Development District or county is the differential between the observed change and expected change. Some Districts and counties performed better than Appalachia Pennsylvania as a whole and vice versa; hence, the total of positive and negative percent shifts equal each other. The shift, in effect, compares the change of an individual area with the change of the area as a whole.

The application of this technique to population in Local Development Districts reveals that the Central Susquehanna Basin District experienced the greatest upward population shift, (49%) showing the greatest comparative population growth vitality of any district in Appalachia Pennsylvania (see last column on Table 3). The Northwestern District is second in growth and the Northeastern District a close third. On the other hand, the Southwestern. Turnpike, North Central, and Northern Tier Districts have experienced a population change resulting in population losses greater than the norm for Appalachia Pennsylvania as a whole. In fact, among all of the seven Districts of Appalachia Pennsylvania, the Southwestern District experienced the greatest out-migration, and absolute loss of population between 1960 and 1965. This trend is due primarily to the losses suffered by Allegheny County, which experienced a downward population shift far in excess of the other counties in Appalachia. However, Westmoreland County, Allegheny's neighbor, apparently gained much of what Allegheny lost, giving it the highest positive population shift in Appalachia Pennsylvania (see Map 13 and Table 4). Similarly, Cambria County suffered the second highest negative population shift while its growing suburbs in Somerset County produced a fairly high positive population shift.

A more detailed review of the economic and population trends in each of the Local Development Districts shows that the <u>Central Susquehanna District</u> gained 19,207 people between 1960 and 1965, for the greatest number of any district, due primarily to a large gain in population in Centre County and smaller gains in other counties. Northumberland County was the only exception because it lost several hundred people during this time. Total employment gains were also registered in every county of the District with the greatest gains made in the Bellefonte-State College labor market area.

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TABLE 4

PERCENTAGE POPULATION SHIFT, 1960-1965, BY APPALACHIA COUNTIES

Counties	Percent Shift by Appalachia Counties
Allegheny	- 52.001
Armstrong	- 3.260
Beaver	- 6.171
Bedford	2.975
Blair	7.368
Bradford	- 0.196
Butler	2.512
Cambria	- 12.258
Cameron	0.244
Carbon	1.838
Centre	10.169
Clarion	1.358
Clearfield	0.823
Clinton	0.351
Columbia	1.396
Crawford	4.113
Elk	1.557
Erie	8.027
Fayette	- 3.070
Forest	0.574
Fulton	1.563
Greene	0.679
Huntingdon	0.753
Indiana	- 3.088
Jefferson	- 1.046
Juniata	1.264
Lackawanna	- 4.649
Lawrence	- 4.042
Luzerne	3.717
Lycoming	2.696
McKean	- 0.845
Mercer	0.225
Mifflin	1.764
Monroe	4.613
Montour	0.537
Northumberland	0.401
Perry	0.158
Pike	C.828
Potter	- 0.958
Schuylkill	2.919
Snyder	3.763
Somerset	2.017
Sullivan	- 0.712

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TABLE 4 (Continued)

PERCENTAGE POPULATION SHIFT, 1960-1965, BY APPALACHIA COUNTIES

Counties	Percent Shift by Appalachia Counties
Susquehanna	- 0.227
Tioga	- 0.750
Union	3.737
Venango	- 1.803
Warren	4.271
Washington	- 4.602
Wayne	2.311
Westmoreland	18.479
Wyoming	- 0.329
Total	<u>+</u> 100%

Source: U. S. Bureau of Census (1960 Population) and Pennsylvania State Planning Board (1965 Population Estimates).

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The Northwestern District also achieved population growth during the 1960 to 1965 period though not as great as the Central Susquehanna Basin District. It gained 4,208 people making it the only other growing District in Appalachia Pennsylvania. This gain came as a result of substantial population increases in Warren and Forest Counties. These increases were nearly offset by declines in the other counties. Since Erie's unemployment rate for 1967 is lower than most of the labor market areas in this District, the labor force may continue to grow, thus increasing total population.

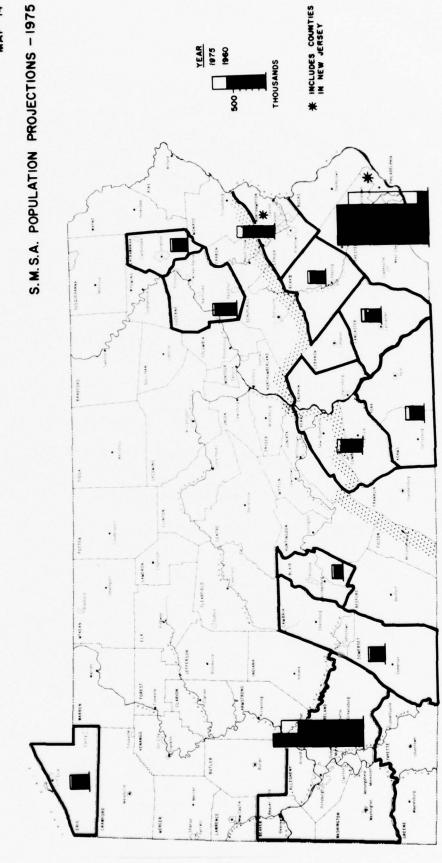
The North Central District has shown a slight decline in population since 1960 (-2,400). This decline has occurred in most of the counties in the District. Cameron and Elk Counties grew 1,200 during the 1960-1965 period. Even though unemployment rates throughout the District declined drametically, there was sufficient unemployment in the growing labor force to fill new jobs without increasing total population. Unemployment rates in the District must still be lowered substantially to achieve a 3% unemployment rate.

The Northern Tier District has experienced greater losses in population than the North Central District (-2,940). In each of the counties population declines have occurred, particularly in Tioga and Bradford Counties, the most populated of the District. Net out-migration has been greater than natural increase despite employment increases. Substantial reductions in the unemployment rate have occurred in the Susquehanna County, Tunkhannock and Dushore-Laporte labor markets.

The Northeastern District would have had population gains if it were not for Lackawanna County which lost over 8,000 in population between 1960 and 1965. Instead, the District lost 1,281 persons. While the populations of Luzerne, Carbon and Schuylkill Counties remained relatively static, substantial gains were made by Monroe and Wayne Counties. This growth results from the growing tourist-recreation industry in the area with consequent low unemployment rates. In contrast, the Lehighton and Pottsville labor market areas still have unemployment rates in excess of the State average though skilled workers are in demand. Scranton (3.0%) and Pottsville (3.9%) were, at the end of 1967, experiencing their lowest unemployment in decades.

The Turnpike District was second in population decline in Appalachia Pennsylvania during the 1960 to 1965 period with a loss of 7,108. Only Fulton, Bedford, and Huntingdon Counties gained population. Though total employment has risen and unemployment rates have declined, the Altoona labor market in Blair County still retains an unemployment rate over 6%. The Johnstown labor market area is not so slack, however, with an unemployment rate of approximately 5%.

The Southwestern District lost the greatest population (-43,428) during the 1960 to 1965 period. Most of the population loss occurred in Allegheny County where a decline of 38,587 population was estimated. Partially offsetting this loss, Westmoreland County gained an estimated 14,370 persons.



In contrast, Washington, Indiana, Armstrong and Beaver Counties experienced comparatively low population declines while Greene and Butler Counties gained slightly in population. This exodus has, in part, been due to an insufficient number of jobs to meet the natural population growth of the District. However, since 1960, employment has increased and unemployment rates have been reduced, in spite of a growth in the civilian labor force. Employment in the Waynesburg labor market area decreased in contrast with the rest of the District. Unemployment rates for Uniontown-Connellsville (7%), Waynesburg (4%) and Indiana (5%) suggest slow growth of jobs in those areas.

Since 1960, in Appalachia there has been a remarkable decline in unemployment, with of course, some pockets of high unemployment found in those parts of Appalachia where economies are based largely on extractive or other non-growth industries. However, Appalachia Pennsylvania must adjust its economy more toward growth industries that experience less cyclical employment variances if it is to obtain its share of future State growth.

A long-range view of Appalachia Pennsylvania population and employment is optimistic. Table 5 indicates that all Appalachia Pennsylvania Standard Metropolitan Statistical Areas are expected to grow in population to the year 1975. This would mean the present downward population trend in Appalachia Pennsylvania may be slowing within these urban centers with an upturn in population growth in store for these areas in the future (see Map 14). The source for the projected population data—the National Planning Association—also projects that the State population will reach a total of 12,848,000 by the year 1975, for an increase of over 1,528,000 people since the decennial Census of 1960.

Table 6 and Map 15 portray the projected outlook for employment in the State's Standard Metropolitan Statistical Areas. Increases in employment are projected for all metropolitan areas in Appalachia Pennsylvania, with the greatest increases projected to occur in the Pittsburgh area.

The foregoing discussion and supporting maps paint a picture of the State's development as shaped by its physical configuration—its waterways and mountain ranges, its areas of economic opportunity and its migratory and settlement patterns. In brief, the picture is one of widespread eastern urbanization with rich, supporting agricultural regions, similar dense urbanization and industrialization in the west and strong cords of transportation binding them together, across the southern reaches of the State. The central and northeastern forest areas are interrupted especially where natural resources afforded economic development opportunities—by coal, lumber, oil and agriculture.

Although Pennsylvania is the Nation's seventh most densely populated state, it still retains approximately two-thirds of its area as a vast central undeveloped or sparsely settled vastness. This central area, much of it to become readily accessible by new and improved highways, affords tremendous opportunities for commerce and recreation. The Generalized

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TABLE 5
STANDARD METROPOLITAN STATISTICAL AREA POPULATION

PROJECTIONS 1960-1975

(thousands)

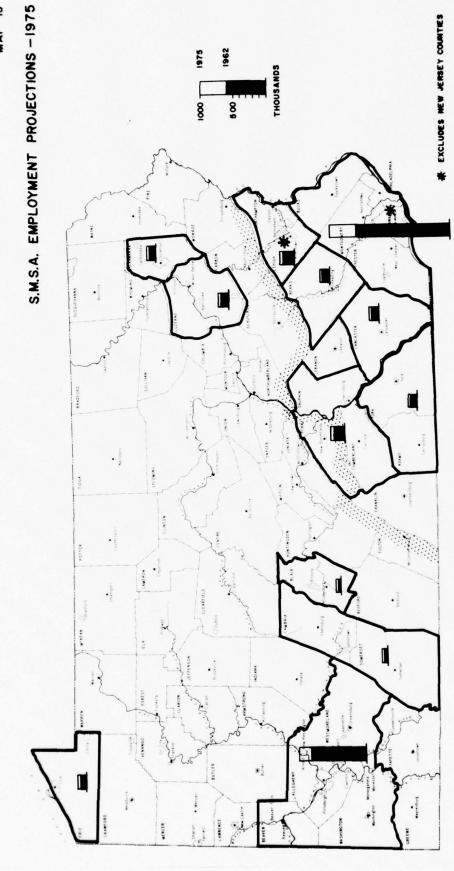
S.M.S.A.	1960	1975	Change	Percent Change
llentown-				
Sothlehem- Caston(1)(2)	493.6	551.4	57.8	11.7
Itoona	137.2	145.0	7.8	5.7
Crie	251.5	289.7	38.2	15.2
Harrisburg(2)	346.5	427.8	81.3	23.5
Johnstown	280.5	286.0	5.5	2.0
ancaster(2)	279.6	308.8	29.2	10.4
Philadelphia(1)(2)	4,361.3	5,168.2	806.9	18.5
'ittsburgh	2,405.4	2,684.6	279.2	11.6
Reading(2)	275.9	293.4	17.5	6.3
Scranton	234.0	243.4	9.4	4.0
Vilkes-Barre	345.9	358.2	12.3	3.6
(ork(2)	239.3	303.1	63.8	26.7

⁽¹⁾ Includes New Jersey Counties

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Source: "Economic and Demographic Projections for Two Hundred and Twenty-four Metropolitan Areas," Vol. III, May 1967, National Planning Association, Washington, D.C.

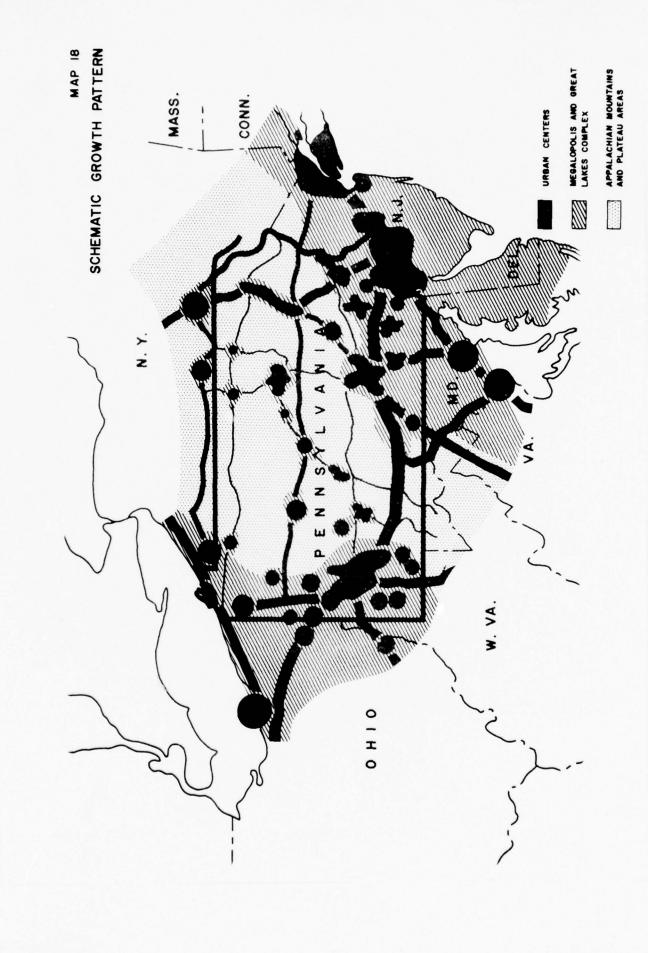
⁽²⁾ Not included in Appalachia Pennsylvania



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TABLE 6
STANDARD METROPOLITAN STATISTICAL AREA EMPLOYMENT
PROJECTIONS 1962-1975

(thousands)

S.M.S.A.	1962	1975	Change	Percent Change
Allentown-				
Bethlehem- Easton(1)(2)	177.4	226.3	48.9	27.6
Altoona	47.3	60.8	13.5	28.5
Erie	90.1	111.1	21.0	23.3
Harrisburg(2)	165.0	208.0	43.0	26.1
Johnstown	77.1	92.4	15.3	19.8
Lancaster(2)	120.0	150.5	30.5	25.4
Philadelphia(1)(2)	1,456.4	1,883.8	427.4	29.3
Pittsburgh	831.8	1,094.3	262.5	31.6
Reading(2)	119.4	145.3	25.9	21.7
Scranton	87.9	109.2	21.3	24.2
Wilkes-Barre	127.9	140.5	12.6	9.9
York(2)	123.2	141.9	18.7	15.2

⁽¹⁾ Excludes New Jersey Counties

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Source: "Economic Demographic Projections for Two Hundred and Twentyfour Metropolitan Areas," Vol. I (Revised) May 1967, National Planning Association, Washington, D.C.

^{(2)&}lt;sub>Not included in Appalachia Pennsylvania</sub>

Economic and Recreational Impact Areas map (Map 16) shows in diagrammatic form, the pressure for development that will be thrust toward central Pennsylvania from the populous areas of eastern "megalopolis" and the similar Great Lakes-Ohio Valley industrial complex at the west. Map 17-Pattern of Urban Recreational Flow--illustrates the convergence upon central Pennsylvania people seeking recreation from six major metropolitan centers.

The Schematic Growth Pattern diagram (Map 18) presents a synthesis of the foregoing maps—a pattern of intensive activity in eastern and western Pennsylvania, and a central area of forests, agriculture and cities within which economic growth and recreational and conservation opportunities may be developed in appropriate balance.

These sketch studies of physiography, development, and opportunity form a backdrop against which water resources projects were evaluated. While the projects were weighed on their individual merits and the immediacy of their need, their relation to the total growth picture in Appalachia Pennsylvania was one of the important considerations.

SECTION II - APPALACHIAN REGIONAL DEVELOPMENT PLANNING

The Appalachian Regional Development Act of 1965 is based on the declaration of Congress that the thirteen-state Appalachian region of the United States lags behind the rest of the Nation in its economic growth and that the region's people have not shared proportionately in the Nation's prosperity. Congress found that the region's uneven past development, with its historical reliance on a few basic industries and agriculture, failed to provide the economic base that is a prerequisite for vigorous, self-sustaining growth.

It is the purpose of the Act to assist the Appalachian region in meeting its special problems, to promote its economic development, and to establish a framework for joint Federal and State cooperation. The Act helps provide the basic facilities essential to the region's growth and identify its common problems and meet its common needs on a coordinated and concerted regional basis. It was Congress' analysis and expectation that as the region obtains the needed physical and transportation facilities and develops its human resources, it will generate a diversified economy and that the programs prescribed in the Act will bring Appalachia back into the mainstream of American economic development.

The Appalachian Regional Commission, established by the Act, is directed to "develop, on a continuing basis, comprehensive and coordinated plans and programs" for the overall development of the region. The objective of Appalachian planning is to assure that Appalachian investments will improve the opportunities for employment, the average level of income, the economic and social development of the region and the standard of living by providing the basic facilities needed for growth, developing the region's human resources, and fostering regional productivity.

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To carry out the purposes of the Act, the Commission was guided by the idea that regional coordination and planning should be the responsibility of the Commission, that action planning for Appalachian programs and projects should be carried out by the states themselves, and each Governor should be responsible for developing an investment plan to govern the use of funds available under the Act. The underlying assumption is that the individual states are best qualified to determine in their respective areas the locations of significant potential for economic growth and to develop priorities for investing funds where the expected return on public dollars will be greatest.

1. PENNSYLVANIA APPALACHIA PLAN FOR PUBLIC INVESTMENT

The Governor has assigned responsibility for the Appalachian program to the Secretary of Commerce, who is the State Member and the Governor's representative on the Appalachian Regional Commission. A Bureau of State and Federal Economic Aid, which coordinates all relevant Federal development programs with those of the State, has been established in the Department of Commerce. The State Planning Board prepares the analyses and plans as advisor to the State Member for the Appalachian program in Pennsylvania. The Department of Community Affairs provides additional program assistance. In addition, the State has established seven Local Development Districts and provides them with financial assistance for such expenses as hiring a technical staff to prepare district development plans and to assist in carrying out the Appalachian program at the local level.

The Act and Rules of the Appalachian Regional Commission require states to prepare development plans to serve as a guide in the allocation of Appalachian funds. Funds were allocated to member states by the Commission according to formulae, which reflect the special needs of each state. Pennsylvania's share in percentages of each program fund is as follows:

Sec. 2	203	(Land stabilization, conservation, and erosion control)	13.051%
Sec. 2	211	(Vocational Education)	18.627%
Sec. 2	212	(Sewage treatment)	25.405%
Sec. 2	214	(Supplements to Federal grants-in-aid programs)	16.973%
Sec.	302	(Administrative expenses of L.D.D.'s and for Research and Demonstrative Projects)	20.92 %

To meet Pennsylvania's responsibilities for an investment plan, the Pennsylvania State Planning Board, in cooperation with the Secretary of Commerce, prepared a Plan for Public Investment in Appalachia Pennsylvania. This guide for the administration of the Commonwealth's Appalachia program was a blending of the principles of the Appalachian Regional Development

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Act, the objectives expressed by the Appalachian Regional Commission and Pennsylvania's own objectives and policies for economic and social development within Appalachia Pennsylvania.

The Plan prescribes a process for accomplishing these objectives by establishing review procedures and a scheme for weighing priorities among projects.

One of the basic findings of the Plan is the fact that Pennsylvania, while a part of the Appalachian region as a whole and sharing many of the characteristics common to the region, is also significantly different from the remainder of the region. The Commonwealth's high degree of urbanization and its concentration of heavy industries are distinctive. Railroading, mining, agriculture and steel manufacture suffered heavy employment losses due to technological changes, making the State stand out as a place where stimulation of new economic generators are needed to replace the old ones. As a result of this obvious need, increased employment and increased income are primary policy goals of the State's Appalachia program.

These goals have been further refined in policies that provide for new employment through the stimulation of new economic activity; improve the skills and capabilities of the work force to adjust to changing industrial and technological conditions; and upgrade the urban environment, particularly with respect to mine subsidence, mine fires, mine acid pollution of streams, and obsolescence of industrial, commercial and residential areas.

The goals of increased employment and income lead to the emphasis on those public investments which serve to improve Appalachia Pennsylvania's manpower quality and which help in locating new employment or stimulate expansion of existing economic activity. The Plan states that investments are to be made where the potential for future growth is determined to be the greatest.

In achieving these goals two principles of administration have been established: first, that functional state agencies, responsible for administering a particular program, are to determine priorities among proposed projects, and second, that communities, because of their intimate knowledge of local conditions, should propose projects and prepare justifications for them.

On the subject of water resources, Pennsylvania Appalachia policy seeks water resources development which will protect or enhance the expansion of existing and potential employment sources. It also emphasizes that this development should take place in "areas where the potential for growth is the greatest" and in those "centers from which population must be served in order to promote the overall development of the region."

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The 4,400 rivers and streams of Pennsylvania have been the object of public concern since the days of William Penn's first conservation instructions to settlers. He directed them to save one acre of woods for every five they cleared, a measure which soil conservationists and hydrologists still laud. Since then a large body of public policies has evolved within the Commonwealth to assure maximum benefit from the State's water resources. The broad goal of these water policies is to promote the integrated development and efficient use of water for a wide range of purposes. Water resources planning and policies are directed at many specific needs ranging from water supply, flood control, and pollution abatement to improvement of recreation, navigation and conservation.

The Department of Forests and Waters has summarized the State's basic water policy in the following manner:

The forests, waters, and other natural resources of the Commonwealth shall be protected, preserved, developed, managed, and controlled for the public good and benefit and in such manner as to assure that all present and future public needs may be met.

Another important statement of the Commonwealth's goals relating to water is incorporated in the "Clean Streams Law":

The discharge of sewage or industrial waste or any noxious and deleterious substances into the waters of the Commonwealth, which is or may become inimical and injurious to the public health, or to animal or aquatic life, or to the uses of such waters for domestic or industrial consumption, or for recreation, is hereby declared not to be a reasonable or natural use of such waters, to be against public policy and to be a public nuisance.

These two statements of the State's goals illustrate both the positive and negative dimenensions necessary for effective contemporary utilization of water resources. Beyond these objectives there are numerous policies administered by a variety of agencies which impinge on the use of water.

1. WATER POLICIES

State regulations affecting lakes, streams and ground water touch a score of different subjects, and each policy or regulation reflects a part of the comprehensive program that deals with water resources.

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a. Water Quality is a primary concern of the Commonwealth today because several forms of pollution have contaminated the otherwise abundant supply. The most serious source of pollution is acid from abandoned coal mines which contaminates an estimated 2300 miles of streams in the Appalachian Counties of Pennsylvania. According to the Division of Sanitary Engineering of the Department of Health which has primary responsibility for pollution abatement, "Many additional miles of streams that are normally alkaline have high concentrations of iron, manganese, aluminum, sulfates, hardness and/or dissolved solids as the result of upstream discharges from abandoned mines."

In 1965, the State Legislature asserted in the Clean Streams Law that: "(1) It is the objective of the Clean Streams Law not only to prevent further pollution of the waters of the Commonwealth, but also to reclaim and restore to a clean, unpolluted condition every stream in Pennsylvania that is presently polluted, and (2) the prevention and elimination of water pollution is recognized as being directly related to the economic future of the Commonwealth."

Responding to its responsibilities for curbing water pollution, the Department of Health has developed "Pennsylvania's Ten Year Mine Drainage Pollution Abatement Program for Abandoned Mines" which is being executed in cooperation with the Federal Water Pollution Control Administration, the Department of Mines and Mineral Industries and other State and Federal agencies.

In 1967, Pennsylvania voters approved a \$500 million Land and Water Conservation and Reclamation Fund, \$150 million of which will be allocated to the Department of Mines and Mineral Industries for abatement of pollution from abandoned mines.

Additional policies affecting mine acid drainage have been instituted by the State Sanitary Water Board which regulates discharges from working mines, both open-pit and underground. New mines may be opened if operators prevent pollution. Open-pit mines must be restored so that exposed coal seams do not contribute acid drainage to surface and subsurface waters.

Pollution by mine acid, then, is being attacked through several policies, both corrective and preventive. The basic responsibility for these programs is delegated to the Sanitary Water Board, the Department of Health and the Department of Mines and Mineral Industries.

b. Oil and Gas Well Pollution is a growing problem as unproductive wells are abandoned in north central counties. As yet, Commonwealth policy toward this problem is unformed because the extent of the problem is unknown. The Department of Health recommends research to determine the extent of action required.

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c. Municipal and Industrial Pollution are second only to mine acid as sources of contamination. The Purity of Waters Act (1903) and the Clean Streams Law (1937 as amended through 1965) establish State control over both municipal and industrial wastes. The Sanitary Water Board is responsible for enforcing this law by issuing orders for pollution abatement. In addition, since 1953 the Commonwealth has made grants to municipalities for both construction and maintenance of sewage treatment facilities. (Since 1957, \$47 million in construction grants has been awarded to municipalities by the Federal government.) In all, some \$900 million has been spent by Pennsylvania municipalities for sewage treatment plants and sewer lines in 137 communities. At least 200 additional municipalities need sewage treatment facilities. There are 464 Appalachian communities in Pennsylvania needing either sewage treatment facilities or sewer lines or both.

These facts take on added significance in that the Sanitary Water Board has established water quality criteria for all interstate streams and is presently developing water quality criteria for intrastate streams. To meet these criteria many existing municipal treatment facilities will have to be upgraded to provide tertiary treatment, and municipalities providing no treatment will have to construct facilities.

State action and policy are clearly aimed at curbing pollution although appropriations at all levels of government fall short of the demonstrable need. Among Appalachian communities there is particular need for grants to prevent pollution of the region's abundant water supplynot only for municipal water requirements, but for industrial and commercial uses which are important to the economic recovery of the region.

The dual problems of industrial pollution and pure water requirements of industrial processes are the most difficult water policy problems. Industries pumping waste into the State's streams are obligated to meet the water quality standards established by the Sanitary Water Board, but compliance is often expensive, and can put an industry at a competitive disadvantage. According to the Department of Health, "consideration should be given to providing some type of economic aid to industries, particularly in Appalachia, for the installation of needed treatment facilities. Such aid might be given in the form of tax incentives, long-term, low-interest loans or in some other form."

The pure water requirements of industries, especially new industries which might be induced to locate in Appalachia, are a compelling economic factor behind the Commonwealth clean streams policy and the need for larger grants for treatment facilities.

d. Reservoir Pollution, according to the Health Department, is another area in which policy--Federal policy, rather than State--is desirable. The Department recommends that "Adequate planning should be conducted and funds should be made available as a part of the Appalachian program to provide sewage facilities at all Federal reservoirs having recreation included as one of the uses."

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e. Silt Pollution Abatement resulting from construction of highways, dams and other improvements is also the subject of Commonwealth policy which takes the form of cooperation between the Department of Health and the agency responsible for construction.

The policies to improve water quality are perhaps the most complex, expensive and involved of Commonwealth goals related to water. However, there are many more policies besides those affecting water quality which impinge on the use and development of this resource.

- f. Water Supply is a matter of State concern. Laws and regulations governing purity, protection of watersheds, withdrawal from streams and similar matters have long been established. The Sanitary Water Board is concerned with the quality of these water supplies and the Water and Power Resources Board regulates the quantities which may be withdrawn from the State's rivers and streams. (Interstate compacts are being instituted as well to regulate withdrawals from interstate rivers and streams.)
- g. <u>Navigation</u> is a concern not only of the United States Army Corps of Engineers, which is charged with maintaining channels and locks on certain rivers, but also the Pennsylvania Fish Commission, which regulates boating on the Commonwealth's rivers and streams.
- h. Support to Port Authorities through enabling legislation and appropriations has been a major interest of the Commonwealth at Philadelphia, Pittsburgh and Erie, an interest growing out of enormous Commonwealth expenditures in the 19th century for the statewide canal system known as the State Works.
- i. Impoundment of water is under the jurisdiction of the Water and Power Resources Board (of the Department of Forests and Waters) despite the fact that impoundment occurs for many different reasons—flood control, navigation, water supply, erosion control and wildlife propagation. Other agencies are involved depending on the particular reasons for the impoundment.

When flood control is the goal, the United States Army Corps of Engineers often undertakes the project and coordinates its activities with the Department of Forests and Waters. For smaller State flood control projects, the Department of Forests and Waters is responsible for the work and coordinates with other appropriate State Departments, including Health, Commerce, Highways, Mines and Mineral Industries, the Fish and Game Commissions, the Soil and Water Conservation Commission, the General State Authority and the State Planning Board.

Impoundment for water supply is regulated by the Water and Power Resources Board with approvals from the Secretary of Health and the Public Utilities Commission.

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Impoundment for conservation and to prevent soil erosion is undertaken by the State Soil and Water Conservation Commission through soil and water conservation districts. Such watershed projects involve water storage for agricultural and domestic use. Similarly, the Department of Forests and Waters manages State forest lands for watershed protection and runoff retardation.

Impoundment for propagation of wildlife is a goal of the Fish Commission which constructs dams to impound water for fishing lakes while the Game Commission impounds water for waterfowl.

Finally, advance acquisition of reservoir sites is a part of the responsibility of the Department of Forests and Waters. Under the Commonwealth's PROJECT 70 program, land for future reservoirs may be acquired although in practice the Department acquires land just prior to construction. This power allows acquisition of land which might later be prohibitively expensive.

- j. Diversion of streams and Withdrawal of water from them are regulated by the Water and Power Resources Board, also. Related to diversion and impoundment are the questions of encroachment into stream channels and channel changes, both of which are likewise controlled by the Water and Power Resources Board.
- k. Hydroelectric Power production is subject to policies and regulations of the Water and Power Resources Board and the Fish Commission (the latter being concerned with the provision of fishways at hydropower structures).
- 1. Recreational use of water receives high priority among Commonwealth agencies, particularly the Department of Forests and Waters which plans and operates the State Park system. A Departmental goal is a network of state parks serving all urban and rural areas and most of these are planned around an existing stream or a reservoir built as part of the development. The Game and Fish Commissions, as already mentioned, develop impoundments for their recreational functions. Local units of government are authorized by State law to expend money for similar recreation uses, and portions of the \$70 million bond issue approved by voters for expanded recreation lands were allocated to them also.
- m. <u>Historic Preservation</u> efforts are often closely related to recreation developments and frequently involve water courses of historic significance including canals, mill races and other uses of water in the past. Identification of worthy historical projects is the responsibility of the Pennsylvania State Historical and Museum Commission which receives State appropriations as well as a portion of funds from PROJECT 70.
- n. <u>Public Ownership</u> of certain streams has been declared by legislative enactment and <u>riparian rights</u> have been defined by law and judicial decisions.

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Where different levels of government are involved, State law provides for local-State-Federal cost sharing and cooperation. For interstate streams compacts are the most promising form for cooperation. The Commonwealth has already joined with other states in the Delaware River Basin Commission, the Great Lakes Commission, Interstate Commission on the Potomac River Basin, Pennsylvania-Ohio Pymatuning Compact, Ohio River Valley Water Sanitation Commission and the Interstate Advisory Committee on the Susquehanna River Basin. Efforts continue to broaden these relations into compacts through which river basin management can be insured.

o. Policies concerning Ground Water remain largely the province of municipalities and counties which regulate installation of sumps, septic tanks and other on-site sewage disposal which can pollute ground water. The Commonwealth does license well-drillers who are required to maintain logs.

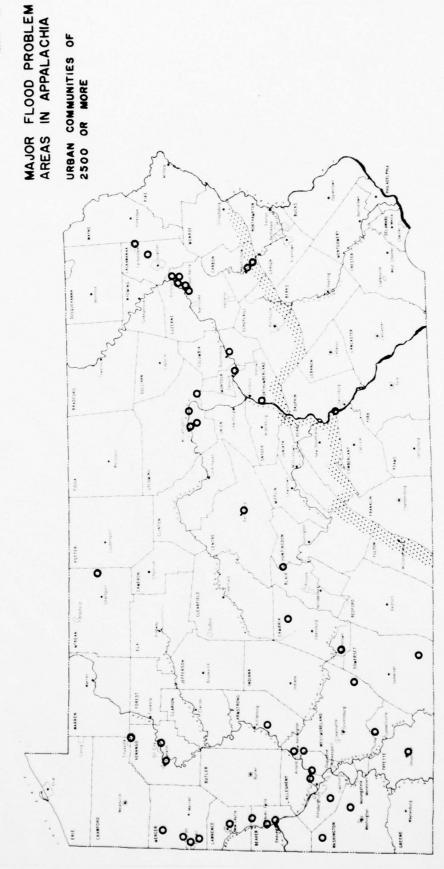
SECTION IV - WATER PROBLEMS AND POTENTIALS

The variety of Commonwealth water policies highlights many of the concerns that surround a decision to enhance water resources—to build a dam, curb pollution discharges or create new sources of water supply. Solutions to water problems usually result in new or renewed water resources. One action may have important ramifications for municipalities, industries, businesses, sportsmen and naturalists simultaneously. Consequently, water resource planners try to weigh all of these interests as they evaluate proposals.

The United States Army Corps of Engineers, for example, performs a cost-benefit analysis on proposed projects in which they consider the value of water supply, flood damage protection, fish and wildlife propagation, hydroelectric power production, navigation demand, pollution abatement and recreational use. The old-fashioned, single-purpose concept of water projects has been superseded by the multi-purpose approach.

The interrelatedness is apparent to most readers; it is the central consideration that has led to comprehensive river basin planning such as that in progress in the Delaware, Susquehanna, Ohio and Potomac basins. Even so, the importance of individual factors varies from place to place, from basin to basin and within basins.

On the Delaware, for example, impoundment for water supply and recreational activity are dominating requirements because of the pressures of eastern seaboard cities. On the Susquehanna, flooding and acid water from mining operations are the salient concerns, while on the Allegheny and Monongahela Rivers, mine, industrial and municipal pollution are fundamental considerations. Within the Ohio Basin, however, flooding problems remain in some areas, and throughout the basin from Pittsburgh to Wheeling, the foreseeable demand for water sports, especially boating, will far outstrip the supply.



While we observe on the one hand that the most efficient means of achieving these various goals is to use a comprehensive approach, we also acknowledge that specialists are required for complex matters such as recreation planning, hydrology, sanitary engineering, and similar matters.

Recreation planners, by virtue of long experience, know almost instinctively where water courses have unrealized potential for recreation development; hydrologists reviewing flow data can quickly identify useful impoundment locations, and sanitary engineers have recently revealed their ability to spot certain kinds of pollution from airplanes.

While all of Appalachia Pennsylvania has not been subjected to detailed study by specialists in each water resource discipline, much work has been completed which generally reveals the conditions and possibilities within the State.

1. CONDITIONS

Existing conditions might be termed problems especially where they are conditions that inhibit development or damage the economic underpinning of an area. The most obvious water problems are flooding, pollution and water supply.

a. Flooding

A general survey of Pennsylvania instituted by the Corps of Engineers revealed that 45 communities of 2,500 or more population are subject to major floods (see Table 7 and Map 19). (A major flood is one in which 40% of the community's buildings have been flooded in the past.) In these communities flood protective works are still lacking. There are, in addition, other communities, industries and highways in Appalachia not listed in which equally severe flooding can occur.

Necessarily, each community requires separate examination and the costs and benefits change from year to year as new buildings are constructed in areas subject to flooding and new impoundments are built upstream reducing hazards. Hence, there is no overall estimate of needs and costs, but there is remarkably common agreement by the Corps of Engineers, the U.S. Department of Agriculture's Soil Conservation Service and the Pennsylvania Department of Forests and Waters on the most serious flooding problems.

To illustrate the extent of this consensus a questionnaire distributed to local officials and State agencies, as well as lists of projects by the Corps of Engineers, brought forth specific recommendations for 89 flood control projects needed throughout Pennsylvania Appalachian counties. Of these, the ten most pressing were quickly settled upon by State flood control experts. Thus, in the absence of long-term, expensive statewide analysis of flooding, such expert evaluation and agreement is the best possible index of conditions and needs.

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TABLE 7 MAJOR FLOOD PROBLEM COMMUNITIES IN

APPALACHIA PENNSYLVANIA

<u>County</u> <u>Community</u>

Allegheny Bridgeville

Etna

Sharpsburg

Tarentum

Armstrong Ford City

Beaver Falls

New Brighton

Blair Tyrone

Cambria Johnstown

Patton

Carbon Jim Thorpe

Lehighton

Centre Bellefonte

Columbia Bloomsburg

Crawford Titusville

Fayette Uniontown

Lackawanna Carbondale

Blakely

Lawrence Ellwood City

New Castle

Luzerne Exeter

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Forty Fort - Swoyersville

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<u>County</u> <u>Community</u>

Luzerne (continued) West Pittston

Wyoming-West Wyoming

Wilkes-Barre

Lycoming Montoursville

Muncy

South Williamsport

Williamsport

McKean Port Allegheny

Mercer Farrell

Greenville

Sharon

Sharpsville

Montour Danville

Perry Marysville

Snyder Selinsgrove

Somerset Myersdale

Venango Franklin

Oil City

Washington Burgettstown

Cannonsburg

Westmoreland Ligonier

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New Kensington

Scottdale

Source: Water Resource Branch, Pennsylvania Department of Forests and Waters

b. Mine Drainage

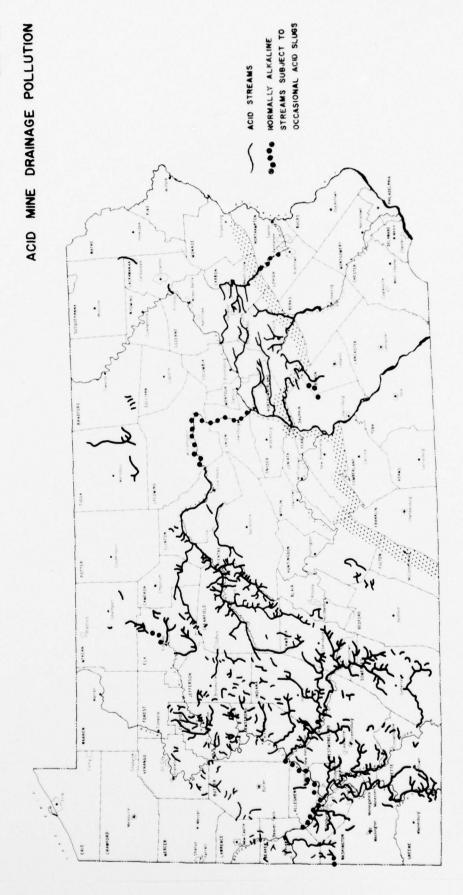
Another illustration of the value of such specialization is revealed in pollution control. Here the Division of Sanitary Engineering of the Pennsylvania Department of Health has conducted extensive surveys and has developed long-term programs for pollution abatement. Five distinct sources of pollution are specified in its reports: acid mine water; oil and gas well contamination of ground waters; municipal wastes; industrial wastes and siltation from highway, dam and other construction projects. Of the five pollutants, the most serious are mine acid and municipal pollution. Maps 20 and 21 illustrate the distribution of these problems. Map 20 shows the streams which acid and those that are normally alkaline but subject to surges of acid from rainstorms called "slugs." Map 21 shows the streams having water quality problems resulting from sewage and biodegradable wastes.

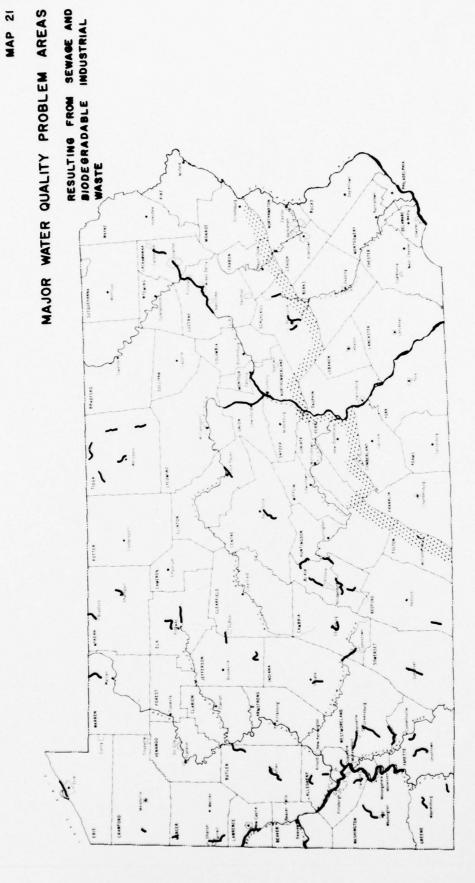
The Division of Sanitary Engineering reports that an estimated 2,300 miles of Pennsylvania streams (most of them in the 52 counties of Appalachia) are acid from mine drainage, and many additional miles are unusable because of other minerals such as iron, manganese, aluminum, sulfates, and dissolved solids that come from mine wastes. By 1967, an estimated 2,750 tons of acid (shown in chart below) were pouring into the State's three major river systems daily. The extent of this pollution is mapped (Map 20) to illustrate which areas of the Commonwealth suffer most. (Not shown are several reservoirs also polluted where recreation development has been inhibited.) Not unexpectedly, these are also the areas with long histories of underground mining, but perhaps more surprising is the extent to which unreclaimed open-pit mining (see Map 22) has affected streams in the anthracite region and in the bituminous country of Clearfield, Jefferson, Clarion, Indiana, Butler and Armstrong Counties. Open-pit mines not only result in pollution when coal seams are left exposed, but the water caught in them often goes into the ground water system which passes through abandoned deep mines, thereby polluting sources of ground water supply as well. A cause of the large mine drainage problem is that adequate legislative controls were not enacted until 1965. Where mining has been discontinued, often discharges of pollution continue, and public funds are needed to abate them.

Acid Flows in Pennsylvania Rivers

River Basin	Acid Tons Per Day
Delaware	50
Main Stem Susquehanna	350
North Branch Susquehanna	600
West Branch Susquehanna	500
Allegheny	400
Monongahela	650
Ohio-Beaver	200

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MAP 22

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A ten-year mine drainage abatement program was instituted by the Department of Health in 1965, in cooperation with State and Federal agencies--most notably the Federal Water Pollution Control Administration and the Pennsylvania Department of Mines and Mineral Industries. (The latter agency has responsibility for mine sealing and back filling operations.) Total cost of the program is expected to exceed \$250 million, a figure likely to increase as field surveys and engineering designs are completed.

c. Oil and Gas Well Contamination

The Division of Sanitary Engineering notes that pollution from oil and gas wells is small in comparison to that resulting from mines. Even so, between 100,000 and 150,000 oil and gas wells in north-central Pennsylvania have been abandoned and constitute a problem. Funds are needed to determine how serious the matter is.

d. Municipal Wastes

Second to mine wastes in terms of seriousness, municipal sewage is responsible for widespread pollution of the State's rivers. As explained by one sanitary engineer, the typical approach of municipalities in the past has been to use deep wells or impound small tributary streams for water supplies and use rivers for waste disposal. Consequently, much corrective work is required.

In the 52 counties of Appalachia Pennsylvania, the Division of Sanitary Engineering reports that 464 municipalities are in need of sewage treatment systems and/or sewer lines. Preliminary estimates are \$290 million for treatment and \$90 million for collection systems. A priority list for Federal grants is developed by the Department of Health and illustrates the extent of problems in Appalachian counties in that 59 of the 99 priority communities are in this section.

As with acid pollution from mines, the problem of municipal wastes is complicated by technical considerations. The most obvious of these is the degree of treatment—primary, secondary or tertiary—waste receives before it is returned to a stream. If rivers are to be returned to a "clean" condition, standards of treatment must rise. Indeed, the Sanitary Water Board is now considering regulations which will require upgrading of 138 primary and intermediate treatment plants in Pennsylvania if adopted. Many small communities are finding the treatment costs high despite State and Federal grants; some are joining their neighbors to build and operate plants to achieve economies.

e. Industrial Wastes

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An estimated 1,100 industries discharge wastes into the rivers and streams of Appalachian counties. Of these an estimated 934 are providing at least minimum treatment, another 94 provide no treatment but

are in the process of installing treatment facilities, and another 77 do not treat their wastes and are in violation of the Clean Streams Law.

Of the 934 industries now complying with the Clean Streams Law there is an undetermined number providing minimum abatement whose discharges still cause some pollution. Many of them are located on acid or acid impregnated streams which mask the contamination of these discharges. About 100 fall into this category—a fifth of them being pulp, paper and steel mills. Most of them discharge biodegradable wastes which are generally difficult and expensive to treat.

2. STATE WATER POTENTIALS

A balanced view of water resources in Appalachia requires not only identification of adverse conditions but realization that much corrective work has already been completed and that undeveloped potentialities for improvement of the social and economic environment exist. Many municipalities pollute nearby streams, but many more have treatment plants. Numerous industries discharge untreated or insufficiently treated wastes into streams, but many more do not; and if mining in the past resulted in unrestricted acid flows into streams, it is prohibited today.

a. Industrial Development

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These improvements are more than esthetic when they upgrade the quality of water. In some cases they have been necessary for industries where water pollution was adding to manufacturing costs. In other instances, stream quality improvement, (like flood protective works) has the obvious effect of making industrial sites more attractive to industrial prospects.

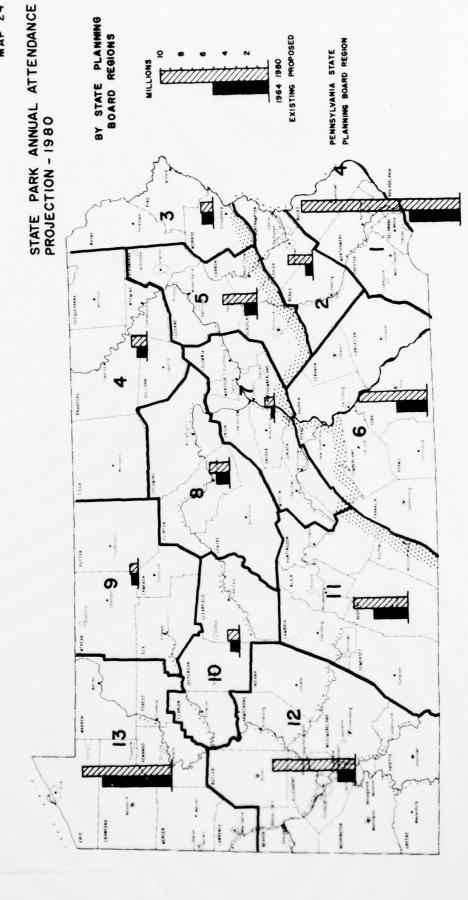
Such benefits are not always immediately measurable because there is no way of knowing what will be developed on a vacant river front site. A marina or a shoe factory or a power plant—each has a different social and economic significance, and for the most part, the decision about what will go there begins in the locality with zoning and development efforts. Even so, potential may not exist at all unless some steps are taken.

Many local planning studies have identified such sites, but no agency seems to have attempted a comprehensive examination of them as a part of flood prevention planning and water quality control. Therefore, even with as useful a concept as the "minimal possible river stage to which the 100-year flood could be reduced" throughout the Ohio River Basin, it is still not known how much land would be made "flood free." Undoubtedly, however, this minimal river stage could be converted to acreages of both developed and undeveloped land that would be protected.

Such estimates are, of course, available as individual impoundments are studied. But no basin-wide figures have yet been developed.

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Hence, no statewide or Appalachian estimate of the industrial potential is now possible.

Nor can the significance of improved water quality be easily measured although sanitary engineers can describe instances where polluted water adds appreciably to manufacturing costs because it must be treated before it can be used. There is no record of the number of industries adversely affected in this way, and there is no way of knowing how many water using industries have not moved to Pennsylvania for this reason. Nevertheless, development authorities are certain that the cleaner the water, the wider the appeal the State has to industrial prospects.

b. Other Commercial Potential

Additional economic ramifications are implicit in river basin development--some actions protect existing business and others enlarge business possibilities. Establishment of navigation is an obvious possibility for a variety of business developments although there is little expectation today for a greatly enlarged navigation system.

Perhaps recreation affords the largest sector of non-industrial business opportunities through water resource development. Service establishments for boating, camping, supplies, resorts, etc., immediately come to mind, but somewhat less apparent are the larger commercial linkages of boating that range from the manufacture of the original boat to supplying it with necessary rigging. In a sense, the construction of a lake insures the blossoming of parts of this recreation industry, a fact that is well-known to development specialists. It is a significant fact, if not always sufficient reason alone, for reservoir construction.

c. Recreation

Aside from economic considerations, recreation also represents a potential for the pleasure of people, and among recreational outlets sought by people water-related activities are among the most popular. Boating alone is expected to grow phenomenally throughout Appalachia--in river basins of Pennsylvania (together with small sections of adjoining states) the estimated 95,000 acres of water available for boating in 1967 should grow to 686,000 by 1980 to meet the demand expected by the Bureau of Outdoor Recreation (U.S. Department of Interior).

Table 8 and Map 23 show the boating impoundment needs of Appalachia Pennsylvania to 1980. They highlight the fact that the Southwestern Development District has the greatest needs. Demands for fishing and swimming would be largely satisfied if boating impoundment needs are met.

The State Planning Board Outdoor Recreation Plan projects substantial increases to State Parks as well. These growth figures are shown by State Planning Board Regions on Map 24, "State Park Annual Attendance Projections-1980" and Table 9. Map 25 shows the location of proposed State Parks and Federal Recreation Areas. (These are listed in Appendix C).

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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
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TABLE 8

WATER IMPOUNDMENT NEEDS FOR BOATING
1980

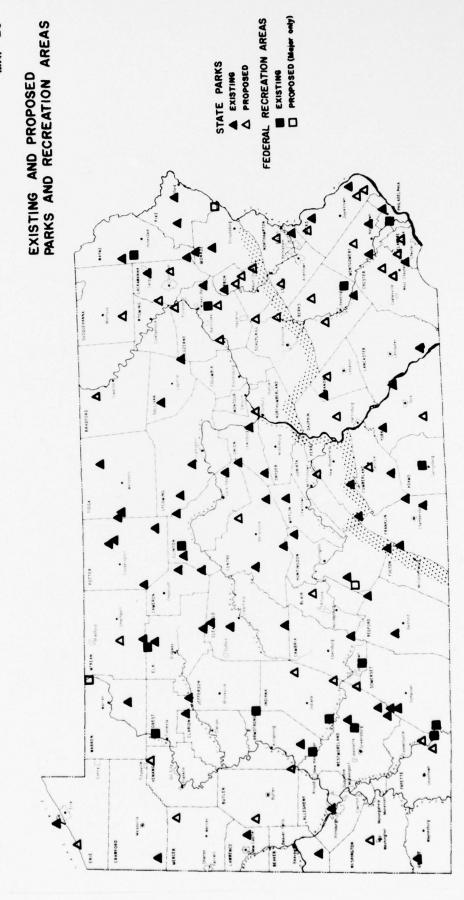
		1980 Needs for	Boating(1)	
Economic Subregion	Area (Sq. Mile)	Annual Activity Days (thousands)	Acres of Impounded Water(2)	Acres per Sq. Mile
1 (13 counties- 3 in Pa.)	10,975	2,948	58,960	5.4
2 (10 counties- 7 in Pa.)	9,454	3,134	62,680	6.6
3 (10 counties- all in Pa.)	5,857	2,680	53,600	9.2
(11 counties- all in Pa.)	7,493	2,551	51,020	6.8
5 (16 counties- 7 in Pa.)	8,027	2,674	53,480	6.7
6 (25 counties- 14 in Pa.)	13,362	20,343	406,860	30.4

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⁽¹⁾ Boating needs include those for fishing and swimming as well.

^{(2) 50} annual activity days per acre of water impounded.

Source: Based upon "A Report on Outdoor Recreation Demand, Supply and Needs in Appalachia" 1967, Eureau of Outdoor Recreation, U.S. Department of the Interior



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TABLE 9

ANNUAL STATE PARK ATTENDANCE
1964 - 1980

Planning	Attendance	(millions)
Region	1964	1980
1	3.8	14.4
2	0.6	2.3
3	1.0	1.2
4	0.9	1.5
5	1.1	3.6
6	2.6	7.7
7	0.3	1.1
8	1.0	2.2
9	0.6	1.0
10	0.8	1.6
11	3.5	5.6
12	1.4	8.0
13	7.3	10.8

Source: "Statewide Outdoor Recreation Plan" 1966, Pennsylvania State Planning Board The potential for <u>fishing</u> in water resource development is highlighted by work of the Pennsylvania Fish Commission. This potential is emphasized by the Commission where pollution abatement will allow stocking of trout and other game fish.

Similarly, the Game Commission develops impoundments for waterfowl and other game. Its acquisition program calls for 5,000 acres of water and land development for waterfowl in Appalachia by 1975. Its expanding program is based on the growing sales of hunting licenses, duck stamps, etc., which indicate expanding needs.

d. Water Supply

Fundamental among the opportunities of water resource development is creation of enlarged water supplies. Per capita needs increase annually; so must water supplies even for areas with little population growth. In the Allegheny River Basin alone water supply requirements are expected to climb from 493 million gallons daily to 659 mgd between 1960 and 1980. This is an increase that can be met easily in the aggregate.

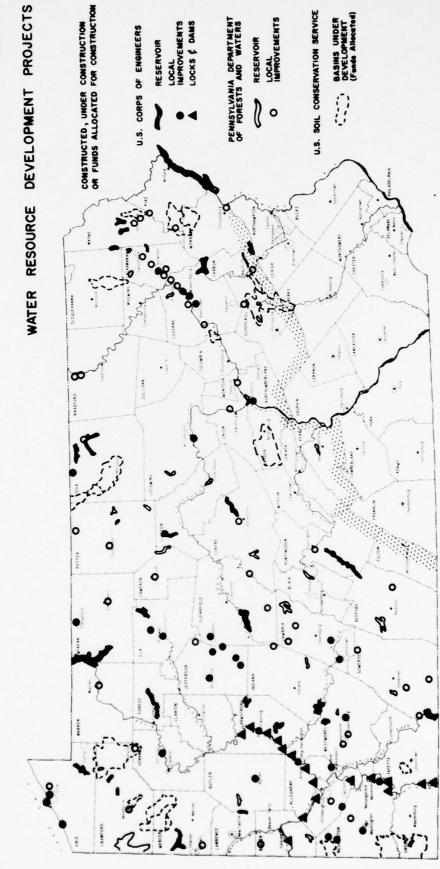
Serious water shortages developed in eastern Pennsylvania during the drought of 1960-66 which forces many communities into emergency measures. In some places "accumulated surface water runoff deficiencies" totaled 50 inches in a five-year period. This condition led the Delaware River Basin Commission to reevaluate estimates of "dependable yields" for the entire basin because of the importance of this water supply source to Philadelphia, New York City and users in the basin.

In other river basins the same is true except that acid water and municipal pollution often preclude the use of these supplies. Such conditions occasionally make water supply a prime justification for undertaking projects. (Among the 230 Appalachia water projects proposed by State agencies and localities, 83 would provide increased water supplies.)

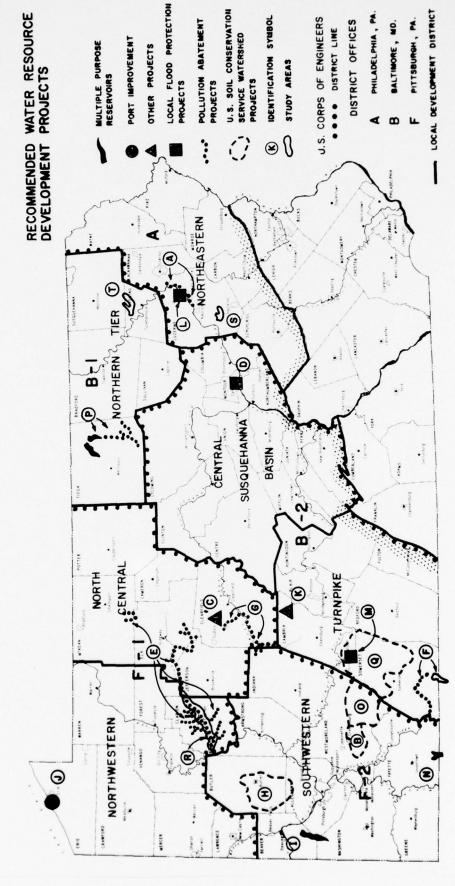
e. Multiple-Purpose Water Resources Development

Combined efforts to achieve water quality control, prevent flooding, promote recreation, improve opportunities for industrial development and achieve the numerous other objectives of water resources development are exemplified in Map 26 which shows projects built, under construction or recently funded. (Appendix D lists these projects by county.) They are evidence that proper development of this resource has been a recurring objective of both the State and Federal governments despite the needs of today.

These projects also illustrate the many objectives that can be achieved in a single project—an achievement with direct bearing on the Appalachian Development Program. This program is also based on the multiple-purpose approach in that it seeks to promote water resource projects needed by communities which will buoy their economies as well.



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Planning policies for water resources in Appalachia Pennsylvania derive directly from concerns for growth and development of the State which will be necessary to insure the economic and social welfare of the people. From a general viewpoint the chief water problems which threaten the well-being of the people and the growth of the economy are those of seriously deteriorated water quality, flooding and insufficient water supplies.

1. CRITERIA

To deal with these problems most effectively a program of conservation, development and utilization of water and related land resources on a comprehensive, coordinated basis is implicit. As an operational principle it is, of course, necessary that all types of major water resources needs be considered. Among these are:

- Adequate supplies of surface and ground waters of suitable quality for domestic, municipal, agricultural and industrial uses;
- Water quality facilities and controls to assure continued supplies of water for these purposes;
- 3. Navigation improvements;
- 4. Hydroelectric power production;
- 5. Flood damage control measures;
- Land stabilization programs;

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- 7. Drainage and land reclamation proposals;
- 8. Watershed management and protection measures;
- 9. Fish and wildlife propagation; and
- 10. Outdoor recreation and education proposals.

(Information on each of these subjects--existing studies, reports, maps, etc., that have been accumulated by various State and Federal agencies--was assembled. A questionnaire was sent to each of the counties in the Appalachian Local Development Districts soliciting supplemental information about water resources problems.)

A second operational principle emerges from the economic development thrust of the Appalachian Regional Act. It is that projects should be proposed in this Supplement which will solve or contribute to the solution of those problems which stand most in the way of development, contribute most to the release of development potentialities, and are regarded as having primary importance and urgency.

Among the social and economic development considerations that were weighed were the degree to which the project would:

- 1. Increase the production of goods and services within the region;
- 2. Expand other economic and business opportunities;
- 3. Enhance the welfare of the people in the region;
- 4. Broaden employment opportunities;
- 5. Raise the level of average income;
- 6. Raise the living standards; and
- 7. Increase productivity.

(To achieve this second objective over 230 proposals submitted by Federal, State and local agencies were examined in light of these seven points; from this process emerged the 17 top priority projects recommended in this report.)

A third operational principle was the implicit understanding that this Supplement would be a synthesis of experts' opinions in both the descriptions of conditions and in recommendations for action. Thus, the work of others was brought together in a general fashion to convey the size of problems or opportunities; more detailed explanation of these matters is correctly the function of the agency administering the program.

Perhaps the most remarkable aspect of this effort at synthesis occurred in proposing recommendations for action—not that it is unusual for experts concerned with a problem like acid pollution to agree upon the three or six most crucial projects. It is noteworthy, however, that experts from different fields concerned with flood control, recreation, waterfowl propagation, economic development, etc., agree on priorities among all these fields. In effect, the agreement substitutes for a scale of weights that might otherwise have been attempted for evaluating the merits of proposed projects. When such unanimity can be achieved among experts, there is, of course, little reason for attempting to devise such a weighting procedure.

Thus, the projects recommended below are the unanimous view of experts from the Department of Mines and Mineral Industries, Department of Health, Department of Highways, Department of Community Affairs, Fish Commission, Game Commission, Department of Agriculture, Department of Forests and Waters and Department of Commerce.

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					Ft	Functions				
	Name of Project and Location	Flood Control	Recrea- Flood Recreation tion En- Control Development hancement (1) (2) (3)	Recrea- tion En- hancement	Water Supply (4)	Water Quality (5)	Conservation and Wild-	Port Improve- ment (7)	Land Restoration and ReclatEducamation tion (8)	Educa- tion (9)
	A. Lackawanna River and Susquehanna River Emergency Project, North Branch Susquehanna and Lackawanna River Basins	*×		×		×	×		×	
V-39-Pa	B. Sewickley Creek Water- shed Flood Protec- tion and Water Supply, Westmoreland County	×			×					
	C. Otocsin Reservoir and Recreation Area, Clearfield County		×				×			
	D. Sechler's Run Flood Protection, Montour County	×						į		
	E. Clarion River Basin Mine Drainage Abate- ment, Clarion River Basin * Irom ground water			×		×	×	*	×	

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RECOMMENDED PROJECTS (Continued)

Name of Project and Location	F. Casse Mine ment, River	G. Upper Susque Mine I ment, Susque Basin	H. Connoquaters! Contro Recrea County	I. Raccoon (Beaver ar Counties	J. Port Erie	K. Nature Educat County
Project tion	F. Casselman River Mine Drainage Abate- ment, Casselman River (see note p.67)	G. Upper West Branch Susquehanna River Mine Drainage Abate- ment, West Branch Susquehanna River Basin	H. Connoquenessing Creek Watershed Flood Control, Water Supply, Recreation, Butler County	I. Raccoon Creek Reservoir, Beaver and Washington Counties	J. Port of Erie Dredging, Erie County	K. Naturealm Conservation Education Area, Cambria County
(1)			×	×		
(2)			×	×		
(3)	×	×				
(4)			×	×		
(5)	×	×		×		
(9)	×	×	×	×		×
(7)					×	
(8)	×	×		×		
(6)						×

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RECOMMENDED PROJECTS (Continued)

L. Abrahams Creek Flood Protection, Luzerne County M. Sam's Run Flood Protection, Cambria County N. Big Sandy Creek Reservoir, Fayette Reservoir, Fayette Control, Water Supply, Recreation, Westmore- land Mine Drainage Abate- Recreation, Somerset Recreation, Somerset Recreation, Somerset Recreation, Somerset County Recreation, Somerset		Na an	Name of Project and Location	(1)	(2)	(3)	(4)	(5)	(9)	(7)	(8)	(6)
M. Sam's Run Flood Protection, Cambria County N. Big Sandy Creek Reservoir, Fayette County O. Upper Loyalhanna Creek Watershed Flood Control, Water Supply, Recreation, Westmore- land County P. Tioga-Hammond Reservoir and Mine Drainage Abate- ment, Tioga County Q. Stony Creek Watershed Flood Control and Recreation, Somerset County County		i	Abrahams Creek Flood Protection, Luzerne County	×								
N. Big Sandy Creek Reservoir, Fayette X X X County O. Upper Loyalhanna Creek Watershed Flood Control, Water Supply, X X Recreation, Westmore- land County P. Tioga-Hammond Reservoir and Mine Drainage Abate- X X ment, Tioga County Q. Stony Creek Watershed Flood Control and Recreation, Somerset County		×	Sam's Run Flood Protection, Cambria County	×								
× × × × × × × × × ×		ż	Big Sandy Creek Reservoir, Fayette County	×	×		×	×	×			
oir X X X X I I I I I I I I I I I I I I I	V= /1-Pa	·	Upper Loyalhanna Creek Watershed Flood Control, Water Supply, Recreation, Westmore-	×	×		×		×			
× ×		۵.	Tioga-Hammond Reservoir and Mine Drainage Abatement, Tioga County	×	×			×	×			
		ò	Stony Creek Watershed Flood Control and Recreation, Somerset County	×	×				×			

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2. RECOMMENDED PROJECTS

The following chart names and summarizes salient features of the seventeen water resources development emergency and top priority projects proposed by the Commonwealth of Pennsylvania for inclusion in the "Report for Development of Water Resources in Appalachia." These seventeen projects are shown on a Statewide basis on Map 27. In addition, a separate map of each project is included with the detailed project descriptions.

Note: The Casselman River Project consists of two parts: mine drainage abatement in the Casselman River and further study of the U.S. Army Corps of Engineers proposed reservoir for the Upper Casselman River. The study should include further locational and engineering investigations of the Upper Casselman reservoir as a top priority water resources project. In addition, the following projects should also receive attention:

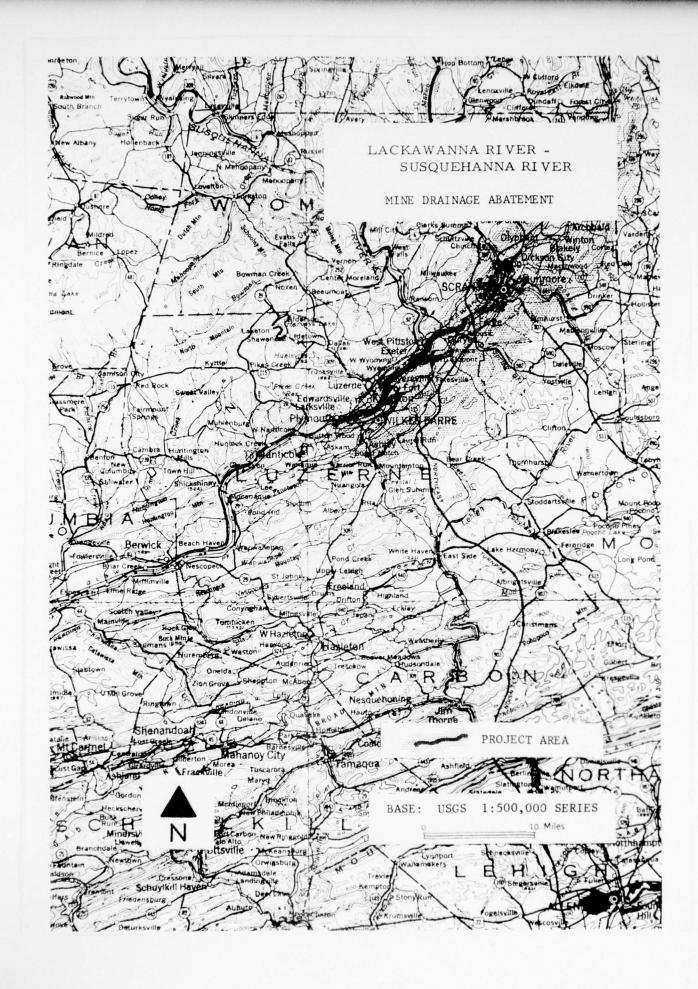
- -further study of the construction of a multi-purpose reservoir proposed by the U.S. Army Corps of Engineers, on the Clarion River, near St. Petersburg in Clarion County, including the consideration of the total impact and effect of this reservoir;
- -study of the proposed reservoir and recreation facility, U.S. Army Corps of Engineers, on <u>Wapwallopen</u> <u>Creek</u>, in Luzerne County;
- -study of the proposed reservoir and recreation facility, U.S. Army Corps of Engineers, on Meshoppen Creek, in Wyoming County.

3. EMERGENCY PROJECT - PROJECT DESCRIPTIONS

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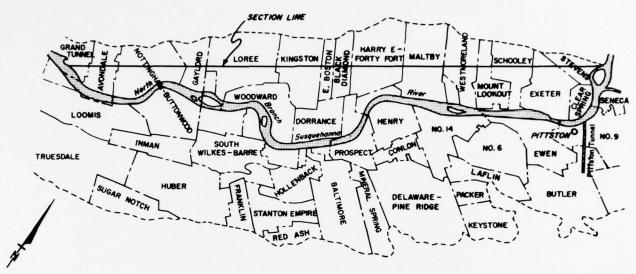
A. Lackawanna River-Susquehanna River Mine Drainage Abatement, Subsidence Prevention and Flood Protection. The cessation of pumping which has prompted closing of anthracite mines in the Lackawanna and Wyoming Valleys is creating crisis conditions of disaster proportions as mines fill with water and threaten to flood low lying sections of Wilkes-Barre, Hanover Township, Jenkins Township, Pittston Township, Kingston and Edwardsville. In addition to flooding, subsidence is a serious hazard as mines fill and raise the water table to the level of some basements.

Intensified mine drainage pollution of the North Branch of the Susquehanna River has killed fish and aquatic life as far down the river as Danville. During the past two decades the acid load of the river has doubled although the total amount of water has remained about the same. Thus, the pollution problem has grown worse, a condition that has occurred along with closing of mines in both Lackawanna and Wyoming Valleys.



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ANTHRACITE MINES IN WYOMING VALLEY



550	GRAND	DALE- TUNNEL	NOTTINGHAM BUTTONWOOD GAYLORD	LOREE	KINGST BLACI DIAMO	(HARRY E- FORTY FORT			SCHOOLEY- MOUNT LOOKOUT	EXETER	STEVENS	SENECA
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30	•	May 2	2, 1967									,,,	
20							مرر	1			_		
10		Octob	nr 10, 1586 -	1	-	1		SUSOL	IEHAN	NA RIVER			
00			October	10, 1966									

DIAGRAMMATIC SECTION THROUGH THE MINES ALONG THE NORTH SIDE OF THE WYOMING VALLEY SHOWING THE MINE-WATER POOLS FOR A HIGH AND LOW WATER LEVEL AND THE PROFILE OF THE SUSQUEHANNA RIVER AT THE CORRESPONDING TIME

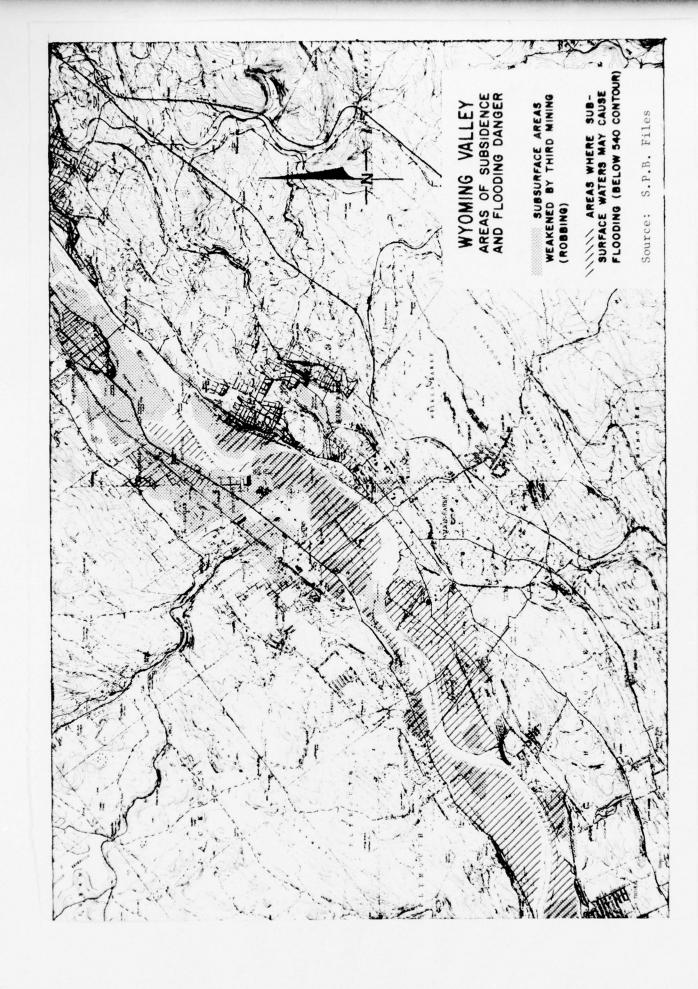
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Source: U. S. Geological Survey

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MINE POOL

SUSQUEHANNA RIVER



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Technical explanations of the chain of events leading to today's crisis are found in two papers contained in the files of the Pennsylvania State Planning Board. The first, "Minutes of A Meeting Regarding The Consequences of Cessation Of Pumping Operations By Blue Coal Corporation" discusses the consequences of cessation of pumping in the Wyoming Valley and the second, "Mine-Water Pools in the Northern Anthracite Field, Pennsylvania" by Wilbur T. Stuart, U.S. Geologic Survey, describes the relationship of the mine-water pools in abandoned mines and the acid mine water in the anthracite area.

The extent of flooding and subsidence is impossible to determine ahead of time, but considerable danger is known to exist especially in the flood plain which lies generally below elevation of 540 feet. (See Map A-1). In addition, fractures in the overburden (through which water may breakout) exist in many parts of the Wyoming Valley. Where coal pillars have been robbed, these fractures are considered most likely to occur.

Data showing the rising water levels in mines are also included in Chart A. As pumping has ceased the ground water levels are rising close to the surface. These waters have been blamed for subsidence conditions in Plymouth after the Nottingham-Buttonwood Mine closed, basement flooding and minor subsidence in Kingston last summer, and the recent loss of two homes (and threat to two blocks of other homes) in the Austin Avenue area of Wilkes-Barre. Cessation of pumping by the Blue Coal Company will allow water to move freely through the Wyoming Valley flooding mines on both sides of the Susquehanna from Forty-Fort to Nanticoke.

An estimated \$68.2 million is required for boreholes, pumps, mine sealing and flushing, land reclamation and back filling necessary to curb these conditions. The project was singled out as an emergency by State agencies concerned with water resources because the combination of conditions could severely damage residential and industrial areas. Already the loss of 1,200 mining jobs has hit the local economy through cessation of pumping.

Economic Effects. Among the benefits of this project are the protection from flooding and subsidence of an undetermined number of homes and businesses in the 9.05 square miles in the flood plain of the densely settled Wyoming Valley.

Pumping and treatment of acid mine water in the Old Forge and Duryea areas of the Lackawanna Basin will remove 66 tons of acid and 31 tons of iron pollutants daily. Approximately equal amounts will be prevented from entering the North Branch system in the Wilkes-Barre area. Thus, almost 200 tons of pollutants daily would be kept from the river.

Once the water quality is improved, the North Branch of the Susquehanna will become useful for industrial and municipal needs. (The Federal Water Pollution Control Administration gave pollution abatement in the Berwick to Pittston section of the North Branch the highest number

of benefit points" indicating that the need is critical and action will be most beneficial.) The Scranton-Wilkes-Barre area has been selected as a primary growth potential center in Appalachia; further job losses from these mine flooding conditions could reverse this growth trend if subsidence should dislocate large employers.

The project should improve water used for the municipal supply in Danville and for processing by Merck and Company across the river from Danville, and downstream communities will benefit by being able to offer a higher grade of water to prospective industries. Water quality will be improved for cooling needs of the United Gas Improvement Company power plant at Hunlock Creek in Luzerne County.

Water of the North Branch basin will be more adaptable for fishing and wildlife propagation. Recreation opportunities, especially boating, will be enhanced, bringing business opportunities to serve the needs of boaters.

4. TOP PRIORITY PROJECTS - PROJECT DESCRIPTIONS

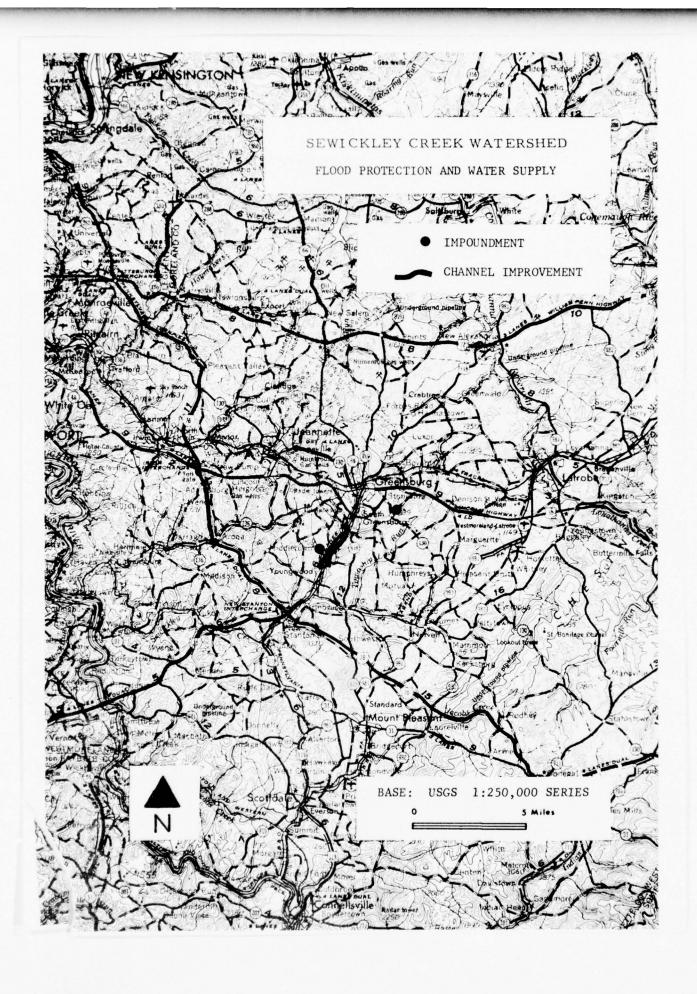
B. Sewickley Creek Watershed Flood Protection and Water Supply. Estimated annual flood damages in the Sewickley Creek Watershed (southwestern part of Westmoreland County) are \$230,700. The bulk of this damage is incurred by factories between South Greensburg and Youngwood which is an area of both substantial industrial activity and potential for much more. The project consists of two proposed reservoirs on tributaries to Jack's Run (P.L. #566 Project). One can be used for flood control and industrial water supplies while the other will be of use for flood control. Water quality in both reservoirs will be good. Both will have some recreation potential. A 2.13 mile channel improvement through the Youngwood area is also required. Estimated cost is \$3,528,800.

Economic Effects. The Borough of Youngwood (1960 population 2,813) would have protection from the 100-year design flood. Existing industries would be protected and 100 acres of land would be made available for development. A creek basin of 166 square miles which contained 67,700 people in 1960 will be protected. Westmoreland County is identified as a primary growth potential area by the Plan For Public Investment in Appalachia.

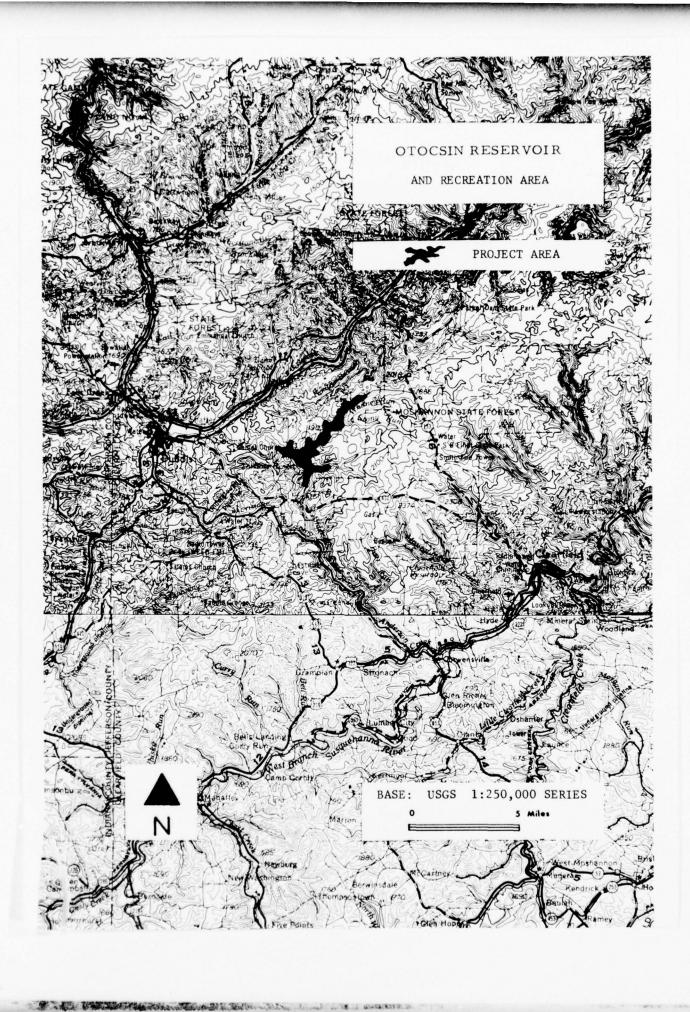
C. Otocsin Reservoir and Recreation Area. Construction of Interstate Highway #80 across the length of Pennsylvania is opening large sections of mountainous country for recreation use. Among the opportunities for development, one of the finest is Lake Otocsin, a proposed 1400-acre lake on Anderson Creek in Clearfield County, which is 4-1/2 miles from the Elliott Interchange. Estimated cost for the reservoir is \$3 million. This is the first step in an overall plan of public and private investment in lodge, motel, camping and commercial facilities estimated to cost \$29 million (\$11 million public investment). The reservoir will serve recreational needs, provide water supply and be the beginning portion of a fish

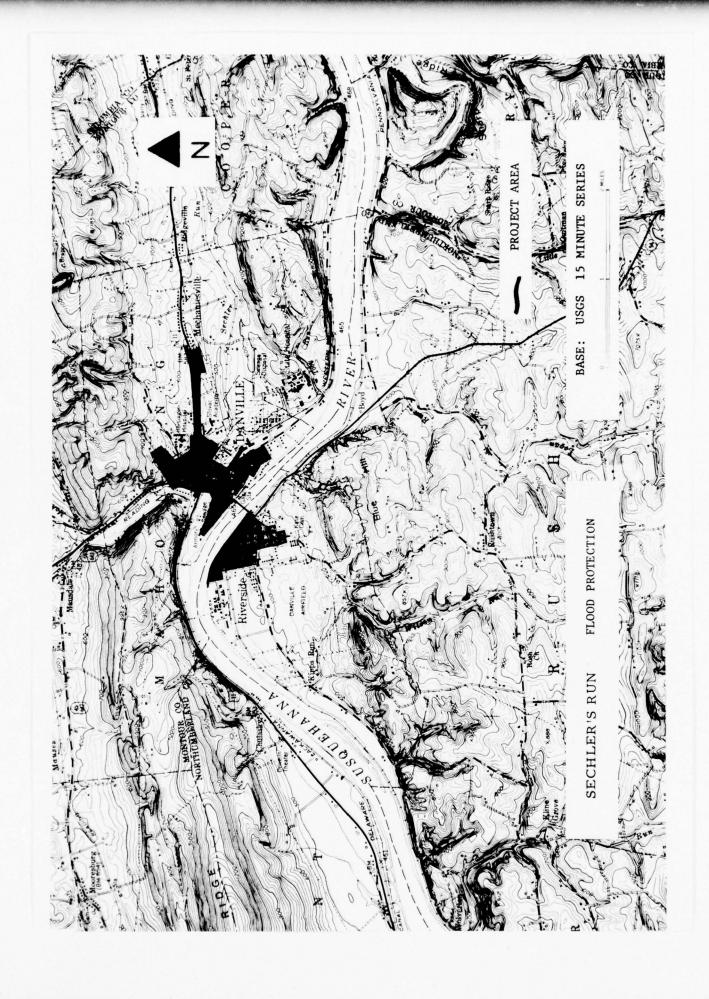
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and wildlife propagation program. (At nearby Mosquito Creek, the Fish Commission plans to develop a rearing pond to stock the area's streams.) The Otocsin project is to be coordinated with the City of DuBois by the Department of Forests and Waters.

Lake Otocsin is the first of several lakes of 10 to 30 acres envisioned for this area. Situated on the short route from New York to Chicago, Otocsin is considered to be in a strategic location for attracting campers, sportsmen and students. In addition to commercial facilities for food and lodging, the plan calls for development of a golf course, narrow gauge railroad, art center (outdoor theatre, a playhouse, an art and music instruction building) and wildlife park, children's zoo and fantasy forest.

Economic Effects. When completed, estimates suggest 50,000 visitors daily for four months, spending approximately \$200,000 daily, and during the remainder of the year the daily spending is estimated at \$25,000 for an annual gross of \$30,000,000. Translated into employment this would result in 950 (annual equivalent) jobs with a payroll estimated at \$9.8 million annually. Another 950 jobs in service industries are expected to result as well.

For the economy of Clearfield County this development promises to be an important economic stimulant which will replace jobs lost during the mechanization of bituminous coal mining. (Declining labor requirements are particularly apparent in strip mining which requires about one-third less labor. Clearfield County leads Pennsylvania in strip mine production.) Unemployment rates in the County exceed the State average. In 1962: Pennsylvania 7.8%; Clearfield 11.9%. In 1966: Pennsylvania 3.4%; Clearfield 5.4%.

D. Sechler's Run Flood Protection. The Borough of Danville has suffered extensive flood damages from both high stages on the Susquehanna River and heavy runoff in the watersheds which drain through the town in Sechler Run and Mahoning Creek. A 1957 study by the Corps of Engineers reported annual flood damages to Danville equivalent to \$360,000 (current prices). In 1958, Sechler Run was dredged. Currently, a levee is under construction along the Susquehanna, engineered by the Department of Forests and Waters. However, flood waters have backed up into the Danville business district on the average of once every two years for the past six decades.

The proposed project will close the gap of Sechler's Run in time of high water on the Susquehanna and thereby protect the large industries within the Borough which have suffered costly shut-downs from flooding. (Danville, Montour County seat, had 2,188 manufacturing employees in 1965, most of whom work in the affected flood plain.)

The project consists of 2,400 feet of channel improvement with levees and/or floodwalls, 1,200 feet of concrete-lined channel, 800 feet of pressure culvert, a pumping station and an interior drainage collection

system. It is estimated to cost \$1,150,000 with a benefit-cost ratio of 3 to 1. Most significantly, it will complete the program of flood protection for Danville.

Economic Effects. Protection of existing industries is the most important aspect of this project, especially since the business and industrial area of Danville is flooded so often. Not only should existing employers feel greater safety in their plant locations, but the Borough should be enhanced for expansion of existing businesses and be more attractive to prospective employers.

E. Clarion River Basin Mine Drainage Abatement. The Clarion River Basin, from McKean County to its mouth at the Allegheny River in Clarion County, suffers from mine acid pollution in varying degrees of severity. Throughout the basin bituminous coal mining, especially strip mining, is prominent and has contributed to Clarion County's present water supply problems. Both surface and ground waters are affected by mine drainage, thereby inhibiting economic development that requires large supplies of clean water.

Aquatic life cannot live in many of the tributaries such as Toby, Piney, Deer and Licking Creeks and Cherry Run. An existing reservoir on the East Branch of the Clarion River will continue to suffer from contamination unless this project is undertaken.

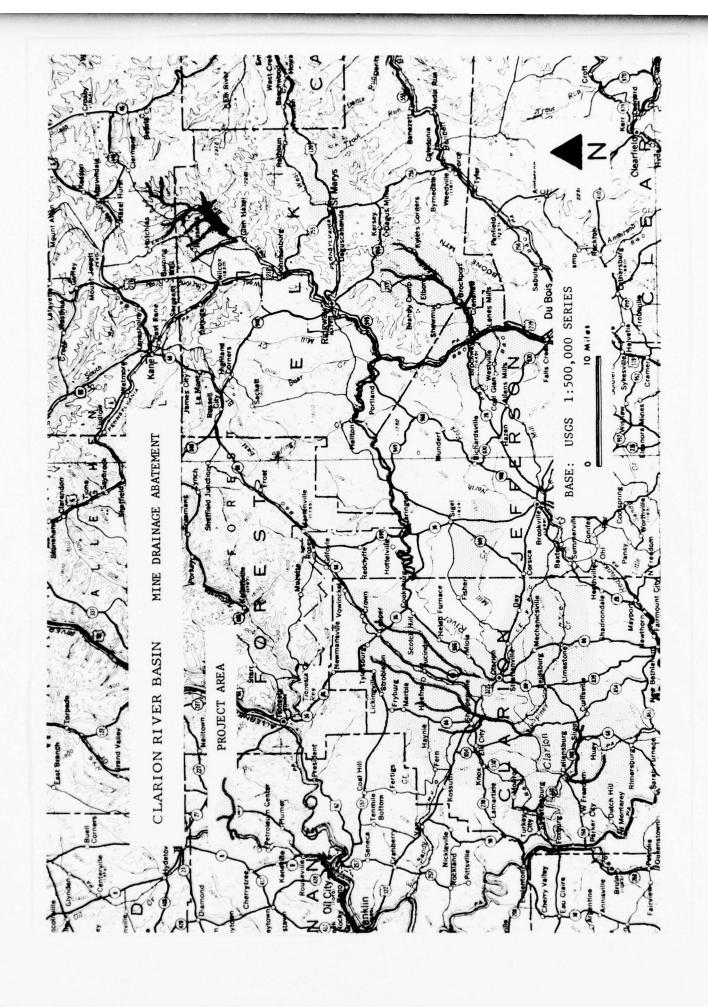
The project will consist of reclamation of strip mine area, mine sealing and grouting, and surface water diversion and treatment, and is expected to cost \$60 million.

Economic Effects. The project will stop entry of 55 tons of acid daily into the Clarion and its tributaries, resulting in reduced processing costs to municipalities and industries. A paper mill at Johnsonburg, for example, would no longer need to neutralize water before using it. Land stabilization and watershed protection to agriculture and woodland in the Clarion Basin will result. Recreation (which currently amounts to 100,000 visitor days per year) will be enhanced through water quality improvement especially as the streams become able to support fish again.

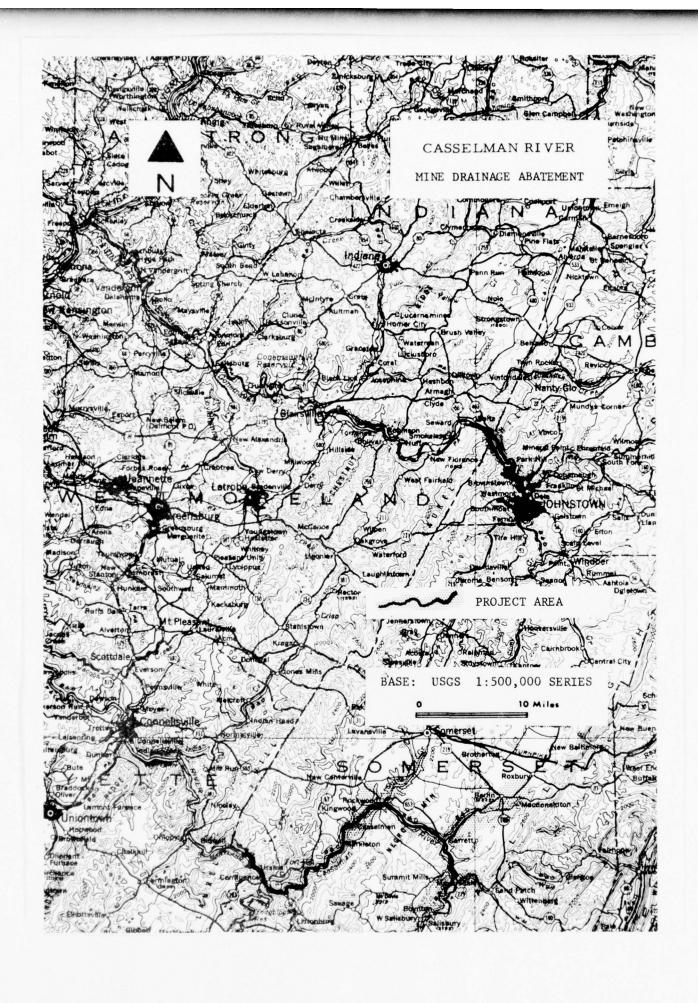
F. Casselman River Mine Drainage Abatement. The Casselman River, which drains much of southern Somerset County, is the major source of mine drainage pollution in the Upper Youghiogheny River (a tributary of the Monongahela). Abatement work in this basin is the first step required to restore fish and other aquatic life to the Casselman and Youghiogheny Rivers. It will consist of reclamation of strip mine areas, mine sealing and grouting, and surface water diversion and treatment. Cost estimates range from \$5 to \$7 million.

Economic Effects. Improved water quality in the Casselman will reduce water treatment costs for downstream water companies, i.e., Connelsville Water Company serving 20,000 people, North Fayette County Municipal

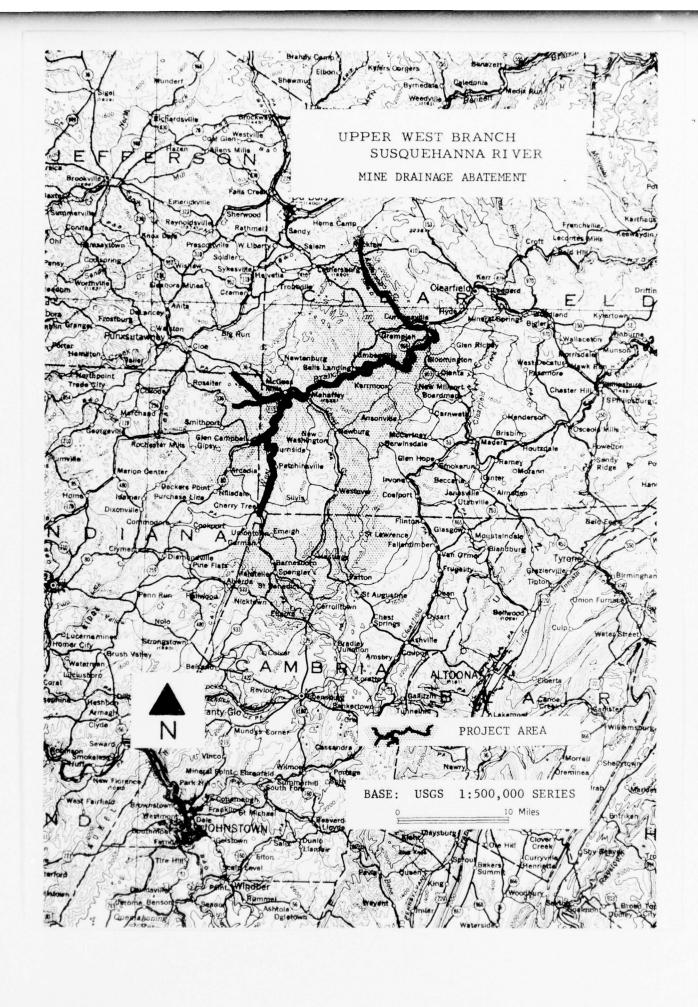
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Authority (5,000), McKeesport Municipal Water Works (70,000) and the Elizabeth Township Water Company (10,000). Likewise, treatment costs for industries along the Monongahela will be reduced.

The recreational benefits will begin with restoration of fish and other aquatic life in the Casselman River, but of equal importance will be the protection of water quality in the Ohiopyle State Park.

Study and Analysis of U.S. Army Corps of Engineers Upper Casselman River multiple-purpose reservoir proposal. This planning project of a proposed reservoir is for investigation of the effects of a reservoir intended to provide flood control, low flow augmentation, conservation and recreation, etc., in the Casselman basin.

G. Upper West Branch Susquehanna River Mine Drainage Abatement. The upper reaches of the West Branch of the Susquehanna are acid impregnated because of past bituminous mining activity in Clearfield and Cambria Counties. The first step in the overall improvement of the West Branch is abatement of mine acid pollution above Curwensville in central Clearfield County. The basin in which these headwaters are found is approximately a tenth of the total West Branch drainage basin (3,337 square miles), and should be undertaken first to achieve the greatest benefits downstream.

The project calls for backfilling and reclamation of strip mine areas (Clearfield leads the State in acres of unreclaimed strip mines), mine sealing and grouting, drainage flow control, diversion channels and treatment. The pollution load of the Basin where the project is to be undertaken averages between 300,000 and 450,000 pounds of acid daily, all of which is to be removed through this estimated \$7.7 million undertaking.

Economic Effects. The Corps of Engineers Curwensville Dam has created a lake around which the Department of Forests and Waters has established Curwensville State Park. The park had 62,311 visitors in 1967, a relatively small number which is readily explained by adverse water quality. Only boating and picnicking facilities have so far been developed because the lake is acid and unsuitable for supporting quantities of aquatic life. And the water is mildly irritating to the eyes when used for swimming. An immediate and important effect to Clearfield County (which has suffered employment losses from the decline of mining) will be the expansion of recreation based businesses.

A long-term benefit to industrial water users downstream will result as the benefits of this project are coupled with similar efforts in the lower tributaries of the West Branch.

H. Connoquenessing Creek Watershed - Flood Control, Water Supply and Recreation. Connoquenessing Creek Basin in Butler and Allegheny Counties covers 77,000 acres and flows through the communities of Butler, Renfrew, Harmony and Zelienople. It and its tributaries have been responsible for

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flooding in Zelienople, Harmony, Evans City and the north side of Butler. Total estimated flood damages are \$382,400 annually. Water quality is generally good although there is some mine drainage from extensive strip mining. There are more than 100 industrial establishments between Butler and Zelienople employing more than 10,000 people.

This project calls for construction of 21 structures to impound 3,000 acres of water and protect 147 square miles of the watershed (P.L. #566 Project). It will cost an estimated \$14,637,300 and provide flood control, recreation, water supply, land restoration and reclamation and enhancement of wildlife.

Economic Effects. Flood prevention benefits are estimated to be \$228,900 annually including 94% protection to Zelienople and Harmony, 82% to Evans City and 75% to the north side of Butler City.

Recreation benefits are estimated to be \$598,600. Three potential structures chosen to include recreation development could provide 420,000 visitor days annually.

Redevelopment benefits including employment of construction and maintenance people are estimated to be \$98,700 annually. Another \$269,000 will result from expanded business activity.

The project will tend to complement the establishment of two State parks currently planned by the Department of Forests and Waters in the watershed, and it will partially fill the large recreation need for boating areas in the Southwestern Development District.

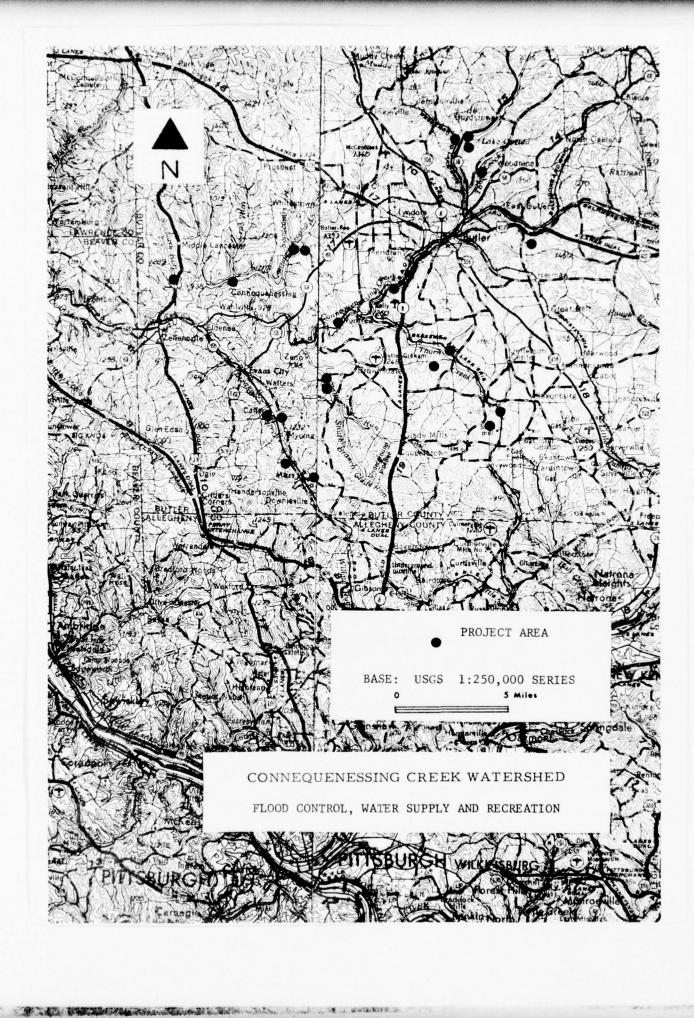
Butler (population 20,000) which draws part of its water supply from the Allegheny River 30 miles away at East Brady would be able to meet its expanding urban and industrial demands from reservoirs to be built in the watershed. (Currently, the City draws about 3-1/2 million gallons daily from the Allegheny River for about 2-1/2 months to augment the supply of its nearby reservoirs.)

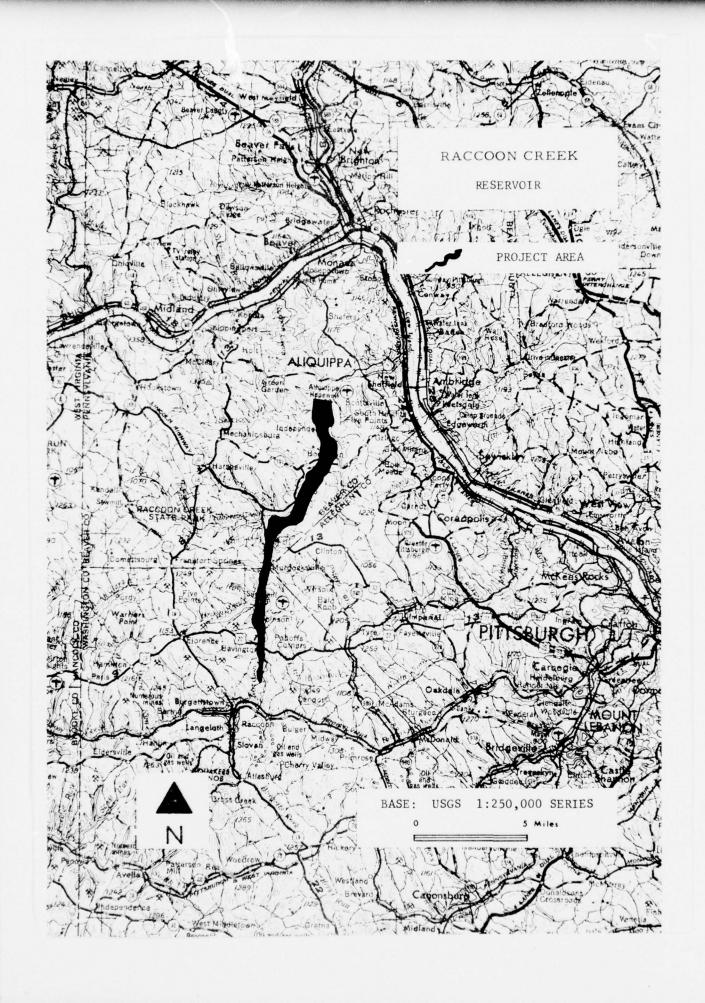
I. Raccoon Creek Reservoir. Raccoon Creek, a tributary of the Ohio River, drains a 147 square mile basin in Washington and Beaver Counties. The reservoir proposed by the Corps of Engineers will abut the popular Raccoon State Park and contribute expanded water recreational facilities to the Southwestern Development District.

This \$35 million project includes construction and acquisition of a 3,660 acre reservoir, and abatement of acid runoff from abandoned bituminous mines. It will provide flood control, improved water quality and water supply sources.

The dam site is nine miles above the Ohio and a few miles north of the authorized Harmon Creek Watershed project in Washington County which is being undertaken for flood control, recreation, water quality and other reasons.

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Economic Effects. Flood benefits will be limited to a six-mile long flood plain immediately below the dam site, and reservoir storage of only three inches of flood control storage can be provided because of the short length of stream to be protected.

Water supply from the reservoir can be extremely valuable to nearby urban and industrial development along the Ohio River. (Aliquippa, population 24,000, is adjacent to the creek basin.)

Mine acid abatement work that will be part of this project is needed to eliminate the present acid impregnation which prevents growth of aquatic life, recreation use or water supply development. Once completed this project will make possible an attractive recreation area for use by the metropolitan Pittsburgh population, and return the Basin's water to conditions that will support fish and other aquatic life.

J. Port of Erie Dredging. Two recent events have injected new life into the Port of Erie, Pennsylvania's only port on the Great Lakes. The first was the completion of the St. Lawrence Seaway which opened the largest inland waterway in the world to the Atlantic Ocean. The second was the announcement in 1967 that Litton Industries would open a ship building works at Erie that will construct barges and other freight hauling craft for use on the Great Lakes. This is the first new shipyard to be opened on the Great Lakes in fifty years.

Increases in port activity are expected to result from these developments, but the present size of the harbor open to vessels of seaway draft (28 feet) is limited to the eastern end. Except for the depth of Erie's harbor, it is the best protected on Lake Erie.

This project calls for dredging the present channel which ranges from 21 to 25 feet in depth to 28 feet to accommodate seaway going vessels and to dredge a turning basin at the interior end of the channel. Estimated cost is \$2 million, with material disposal.

Economic Effects. The impact of this improvement is currently under study by consulting engineers retained by the Port of Erie Authority. However, it is known that by dredging some 8,800 feet of channel the quantity of land available for water transporation use in Erie will be doubled. (In 1967 Erie handled 50,000 tons of Seaway traffic.)

An earlier study indicated the need for dredging at least 660,000 cubic yards of material to open up this area, a number that has been revised upwards about a third.

For this project the tangible economic benefits are hardest to identify because it is needed primarily as an economic stimulus. As in the case of highway improvements deemed helpful elsewhere in Appalachia, this project is important because of the potential it can release by opening a larger portion of Erie harbor to larger vessels, thereby improving business opportunities.

The City's other transportation facilities which can feed the Port of Erie include four railroads: the Bessemer and Lake Erie; the New York Central; the Nickel Plate and the Pennsylvania; and two interstate highways--90 and 79 (under construction).

K. Naturealm Conservation-Education Area. Naturealm is a multiple-purpose concept to use part of Prince Gallitzin State Park reservoir for cultural enrichment and economic development. Like many recreation projects, it is a proposal to exploit an existing water setting and maximize the economic potential of a scenic area in a region where the economy has been depressed by losses of jobs in railroading, coal mining, steel manufacture and agriculture.

Prince Gallitzin is a 6,600-acre State park 20 miles northwest of Altoona and 35 miles north of Johnstown, both of which are Standard Metropolitan Statistical Areas. It contains the 1,760-acre Glendale Lake with boating, swimming and fishing facilities. Beside this lake a 1,500-acre site has been set aside for the \$9.5 million Naturealm conservation-education development.

The proposal calls for an intensive use Conservation Education Area on a peninsula in the center of the park and a large Nature Preserve located along the eastern and southern boundaries. A Student Center, a Natural Science Center and supporting facilities will be located in the Conservation Education Area and be surrounded by demonstration areas showing the work of the Department of Forests and Waters (timber management, fire control, etc.), the Pennsylvania Soil Conservation Commission (plant disease control, soil erosion protection, etc.), the Pennsylvania Game Commission (feeding stations, animal observation, etc.) and the Pennsylvania Fish Commission (trout holding ponds, aquarium, etc.). Courses for students from seven to seventeen will be offered. Curricula are to be developed by the Department of Public Instruction.

Economic Effects. When completed, 438 (12-month equivalent) jobs will directly result from Naturealm and an equal number would be generated by supporting commercial activities. This will mean a \$4,550,200 payroll.

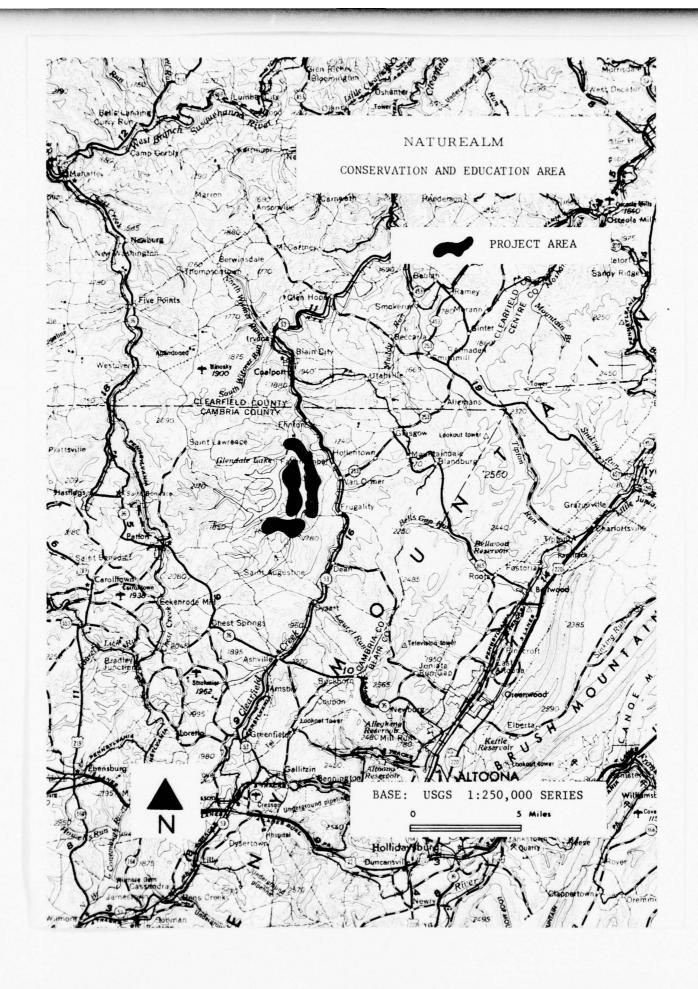
An additional 1,710 jobs are expected as a result of private development that would be stimulated in motels, lodge, and winter sports areas. These jobs would, in turn, prompt an estimated 500 jobs in service enterprises, according to consultants who examined the proposal under contract to the Area Redevelopment Administration (U.S. Department of Commerce). At an average of \$5,200 annually, the resulting gross payroll would exceed \$11 million per year.

In sum, the economic impact is: 3,086 jobs (12-month employment equivalents); \$16 million payroll; \$10 million gross annual sales income plus home building and other economic stimulation.

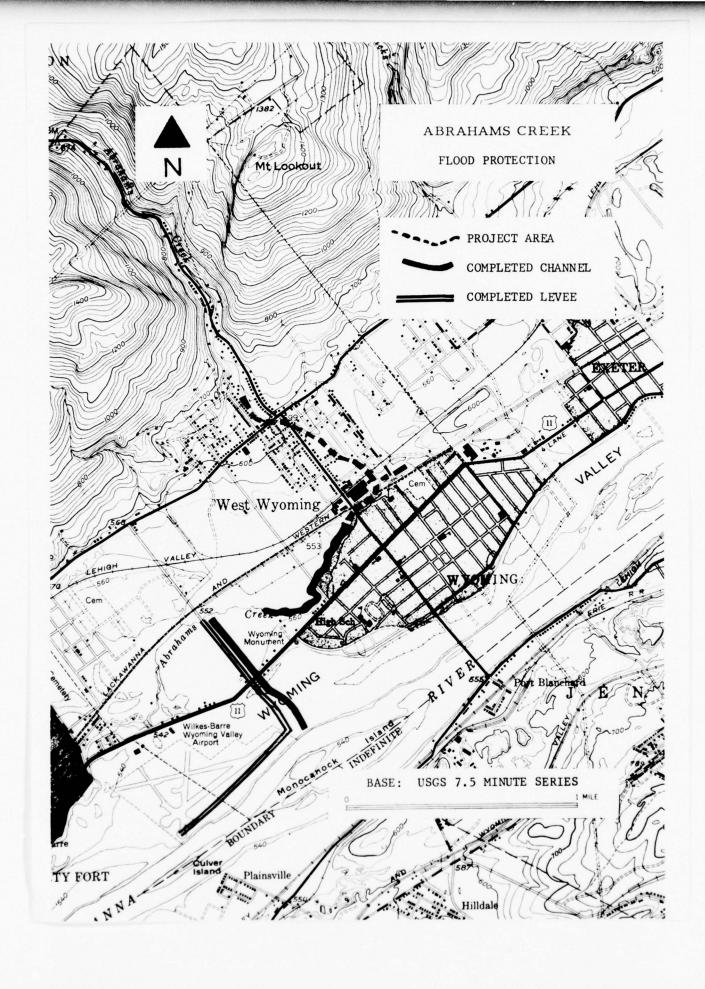
For both Johnstown and Altoona which continue to have unemployment rates above the State average, this project would be an important economic boost.

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L. Abraham's Creek Flood Protection. Abraham's Creek flows southeast through Wyoming and West Wyoming (Luzerne County) to the North Branch of the Susquehanna River and has flooded these two boroughs several times in the past. Recent serious floods occurred in 1959 (\$135,000 damages), 1955 (\$285,000 damages) and 1946 (\$416,000).

The effects of a small amount of over-topping of the creek channel are severe because of unusual geologic conditions. The creek channel cuts through a glacial deposit that is fan or cone-shaped; thus, once water pours over its banks, it drains away from the creek into homes and businesses that have been built on this alluvial deposit.

The Department of Forests and Waters has investigated the problem and found that the present channel has a capacity of 600 cubic feet per second (cfs) and that the 1946 flood discharged 4,200 cfs. Since then, Frances Slocum Dam has been built and will reduce the 1946 flood to 2,200 cfs.

This flood protection project calls for the construction of 5,000 feet of improved channel with a 2,200 cfs capacity and 800 feet of levee four feet high at a cost of \$500,000.

Economic Effects. Construction of this project will protect existing homes and businesses from a recurrence of the most severe flood on record. Of the past damages 25% in Wyoming Borough and 60% in West Wyoming were sustained by industrial and commercial establishments.

The benefit cost ratio estimated by the Department of Forests and Waters is 2.12:1, a ratio which takes into account \$200,000 of the construction costs for Frances Slocum Dam.

M. Sam's Run Flood Protection. Sam's Run drains through Lorain Borough and a narrow portion of the City of Johnstown (Cambria County) before joining Stony Creek, a tributary of the Conemaugh River. During the Depression the WPA built a stone channel to carry the water through the residential and commercial sections of Lorain and an industrial section of Johnstown.

Today, the channel (which is adequate for flood prevention) has deteriorated seriously and requires immediate repairs. An engineering report by the Department of Forests and Waters recommended that in addition to repairing the existing channel, the bridge opening at the mouth of the Run be enlarged, the channel be lengthened above the Borough of Lorain (to protect additional residential sections), and a settling basin be constructed at the entrance to the channel. (This settling basin would collect material that would otherwise be deposited at the mouth of the Run and constrict the channel.) Estimated cost for both repair and enlargement is \$320,000.

Economic Effects. It is estimated that channel repair now will cost \$100,000; yet if the channel is allowed to deteriorate further and replacement becomes necessary, it will cost \$1 million. (The City of Johnstown has indicated it is financially unable to make the repairs.)

U.S. Steel Corporation (1,353 employees in 1965) is located near the mouth of Sam's Run and is an important source of employment to Johnstown, a Standard Metropolitan Statistical Area which suffered severe employment losses in mining and manufacturing during the 1950's. (Among its losses was the National Radiator Company - employment 512 in 1959 - located west of the Run at its mouth.) Maintenance of Sam's Run channel is important protection to U.S. Steel Corporation.

N. Big Sandy Creek Reservoir. The Big Sandy Creek Basin in southern Fayette County, Pennsylvania, and Preston County, West Virginia, is an exceptionally attractive wilderness area in which a 3,100-acre multipurpose reservoir can be developed for recreation, flood control, water supply and water quality. This proposal by the Corps of Engineers has already been examined in light of several considerations: (1) a substantial recreation market was found to exist by a Pennsylvania State University study for the Bureau of Outdoor Recreation; (2) an economic justification analysis of the project was made by the Pennsylvania Economy League; (3) a comprehensive plan of the area around the reservoir is being prepared by a consultant to the Fayette County Planning Commission. Final location and design of project is to be coordinated between the Corps of Engineers and the Department of Forests and Waters.

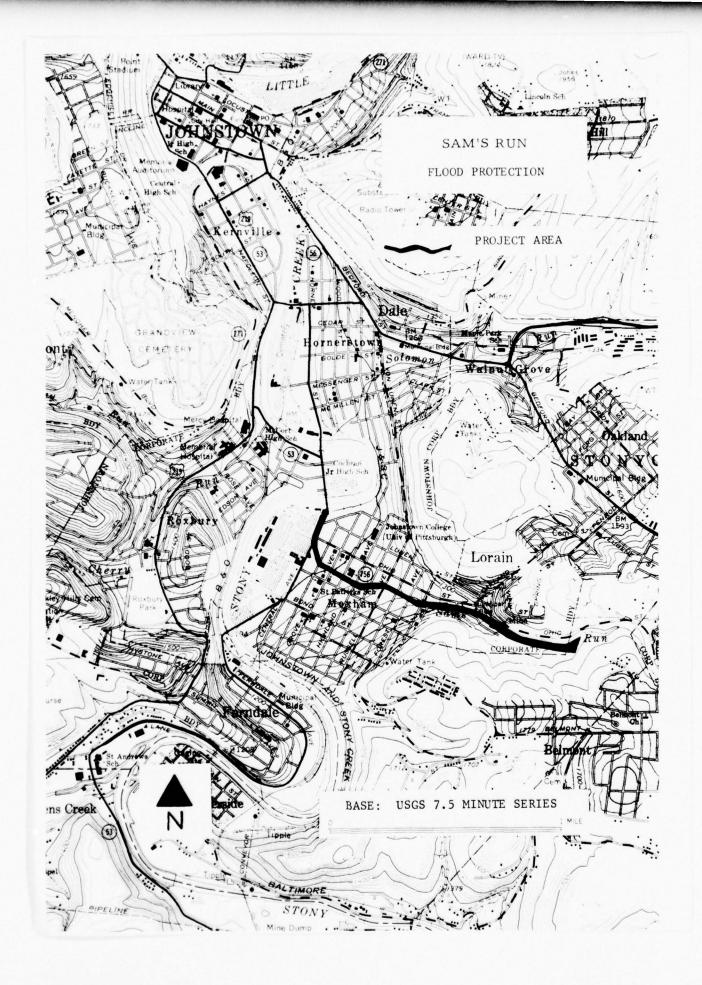
The proposed 54-mile shoreline reservoir will cost an estimated \$25 million, including construction of recreation facilities.

Economic Effects. The map of water impoundment needs shows that Fayette County lies in the district of Pennsylvania where the need for boating waters is greatest. For Fayette County which has suffered severe losses of mining employment, the aconomic importance of a recreation development is particularly important. (By 1966, unemployment in the County had dropped to 7% in contrast to the State which had declined to 3%.)

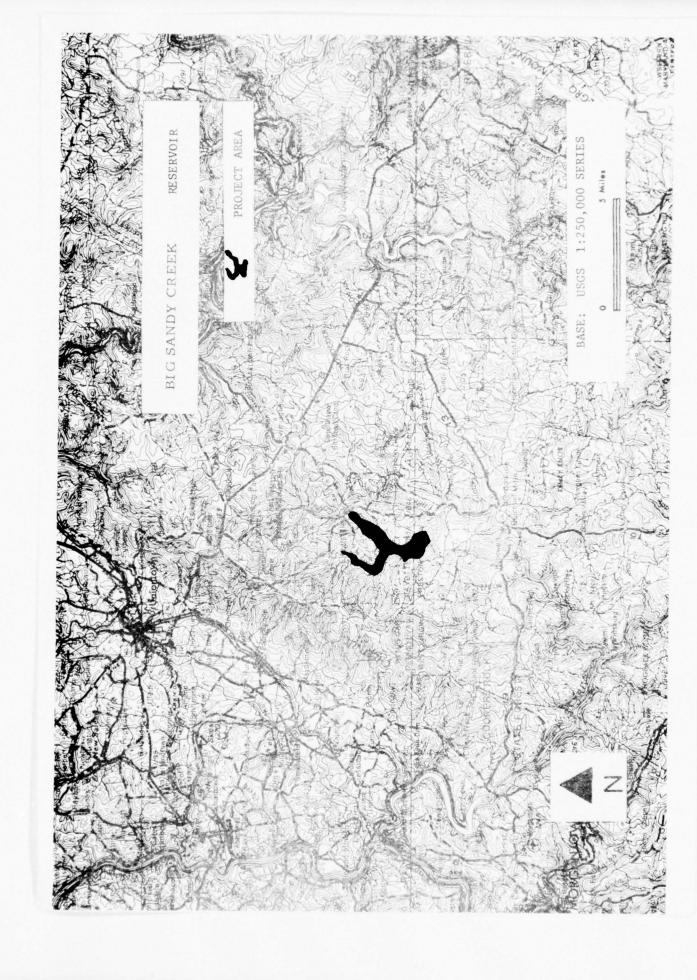
The deep, narrow lake that would be formed will lie in a rugged area not suitable to industrial development, thus the reservoir will augment and in no way compete with other economic interests.

Visitor expectation is high due to the fact that 2.1 million people live within two hours driving time of the reservoir. Experience of nearby Youghiogheny Reservoir (of limited summer use because they are drawn down for low flow augmentation) shows that a daily peak of 27,000 users occurs on this reservoir. The recreation market demand in the Southern Laurel Highlands (including the Big Sandy Basin) is 600,000 vacationers, 1,400,000 weekend visitors and 2,000,000 day visitors according to the Pennsylvania State University estimates for the Bureau of Outdoor Recreation.

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O. Upper Loyalhanna Creek Watershed - Flood Control, Water Supply and Recreation. The Upper Loyalhanna Creek drains a 211 square mile basin in southeastern Westmoreland County which contains 44,500 people (1960). It flows northwesterly through the communities of Rector, Ligonier, Kingston and Latrobe and is responsible for \$45,300 estimated flood damages.

The watershed lies in the fastest growing county in Appalachia Pennsylvania. There is some coal mining in the area, but the stream has not been polluted by mine drainage.

This project will reduct flood damages, provide recreation facilities, impound water supplies and stimulate employment through the construction of seven structures and appurtenant facilities. (P.L. #566 project) Its estimated cost is \$7,621,400.

Economic Effects. The seven proposed structures will control 25% of the watershed and eliminate \$27,200 of the estimated annual flood damages in the Basin (including 73% of the damages suffered by Ligonier Borough).

Through creation of one reservoir of 540 acres and facilities for picnicking, swimming, boating, fishing, etc., 472,400 visitor days per year will be generated. Primary recreation benefits are estimated at \$567,000 annually.

Another of the proposed impoundments will provide 3,440 acre feet of municipal water supply in addition to flood prevention storage.

Redevelopment benefits as measured primarily in wages and salaries of employment generated (30% of construction costs and 50% of maintenance costs) will be \$55,800 annually, and secondary benefits from the project are estimated at \$66,900 per year.

The ratio of average annual benefits to average annual costs (including primary and secondary benefits) is 2.1:1.

P. Tioga-Hammond Reservoir and Mine Drainage Abatement. Tioga-Hammond Reservoir is in the advanced planning stage by the U.S. Army Corps of Engineers. It consists of two dams close by one another, one is to be on Crooked Creek and the other on Tioga River. They will back up two reservoirs which will be separated by a small hillside, and of the two reservoirs. Crooked Creek has much the larger capacity.

This fact is important for flood control since it is planned that excess high waters from the Tioga River will be diverted to the Crooked Creek Reservoir. Unfortunately, Tioga River is acid impregnated with an average estimated 140,000 pounds of mine acid daily. Flood waters from it will cause fish kills in Crooked Creek Reservoir and inhibit aquatic life.

The project was initiated for the flood control benefits that will result for cities in New York State. The project is included here to accelerate consideration and action and to achieve pollution abatement when the dams are constructed. Estimated cost of pollution abatement is \$7.25 million.

Economic Effects. The flood benefits of this project to communities in New York State have been previously justified by the Corps of Engineers.

The recreation benefits to Pennsylvania can be manifold if pollution on the Tioga River is abated. (Because of the nature of pollution sources the 140,000 daily average of acid occasionally hits 1,000,000 pounds.) Once pollution is abated, aquatic life, waterfowl and other animal life will be enhanced, and body contact water sports will be stimulated.

The proposed reservoirs are close to two "Applachian Corridor" high-ways: U.S. 15 in Pennsylvania and N.Y. 17 in New York which are expected to bring interstate visitors to the reservoirs.

Q. Stony Creek Watershed - Flood Control and Recreation. Stony Creek Watershed covers 467 square miles in Somerset and Cambria Counties and lies between Berlin and Johnstown. Small urban areas such as Hooversville, Hollsopple and Kring have been subject to flooding in the past, as have railroads and highways.

Bituminous strip mining is common throughout the Watershed with approximately 1,000 acres of land opened annually. As a consequence of this mining activity Stony Creek and many of its tributaries are acid impregnated.

This project calls for flood control, land reclamation and recreation improvements through construction of five structures that will control 124 miles of the Watershed. (P.L. #566 Project) Estimated cost is \$7,851,260.

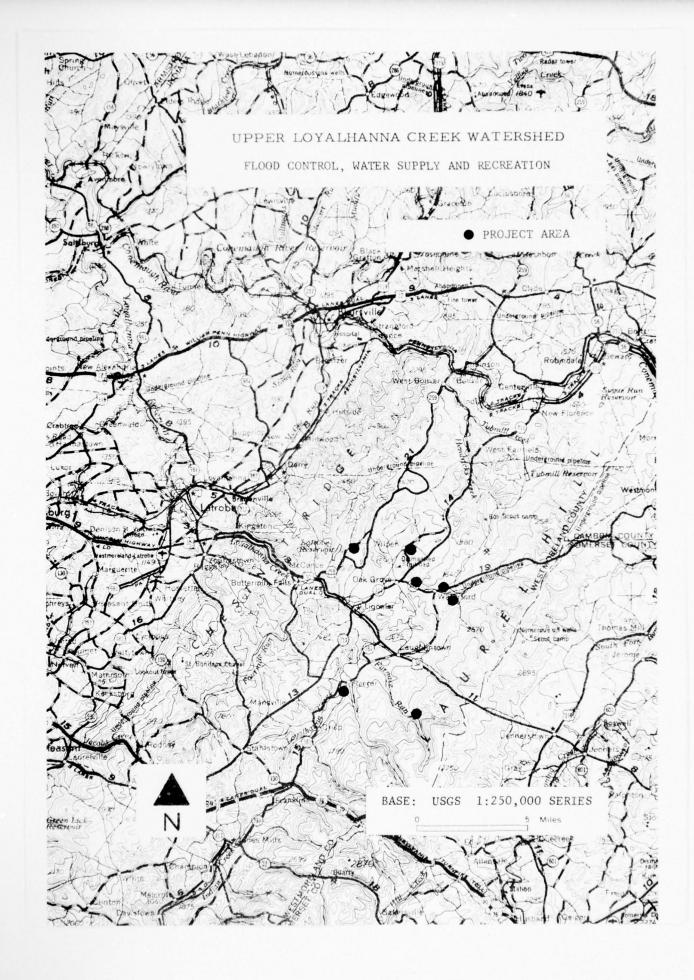
Three of the dams will contribute to flood control and recreation; one will provide flood control and other beneficial use; and one will provide only flood control. All proposed structures are located on tributaries free from mine impregnation.

Economic Effects. Of the \$257,400 annual estimated flood damages incurred in the Watershed, the project should eliminate \$189,000 annually. About 200 acres will be protected by the five structures.

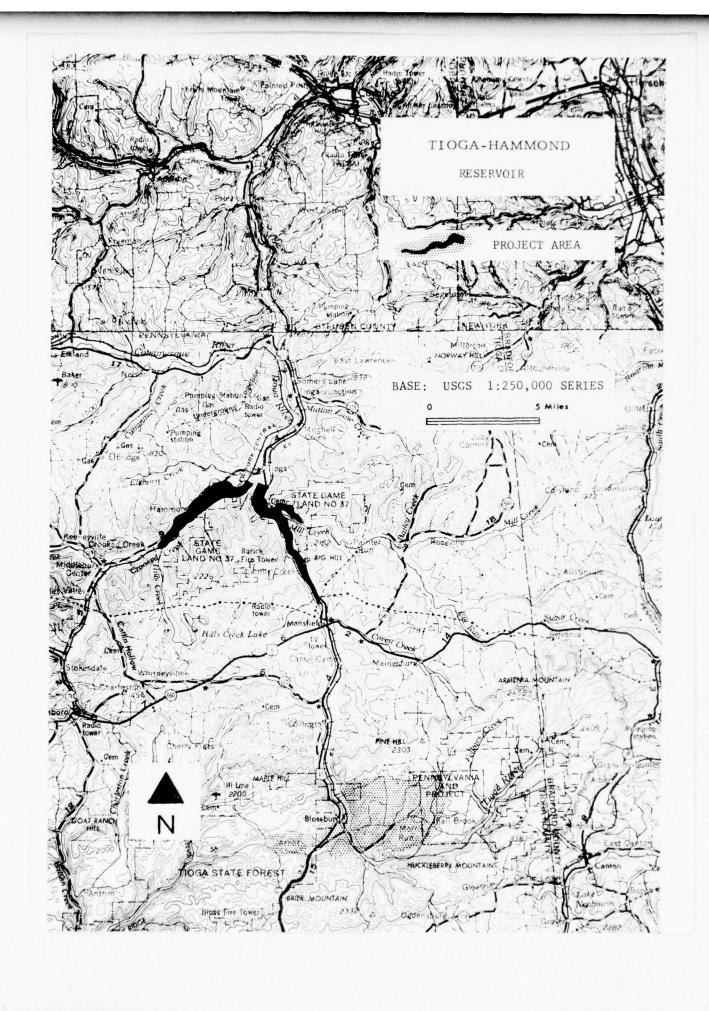
Recreational facilities in the Watershed are now limited; the project offers a potential of 870 acres of water surface plus surrounding facilities for boating, bathing, fishing, etc., which are expected to attract 150,000 visitors annually who will spend an estimated \$180,000. Additional business activity estimated at \$108,500 should be generated in turn.

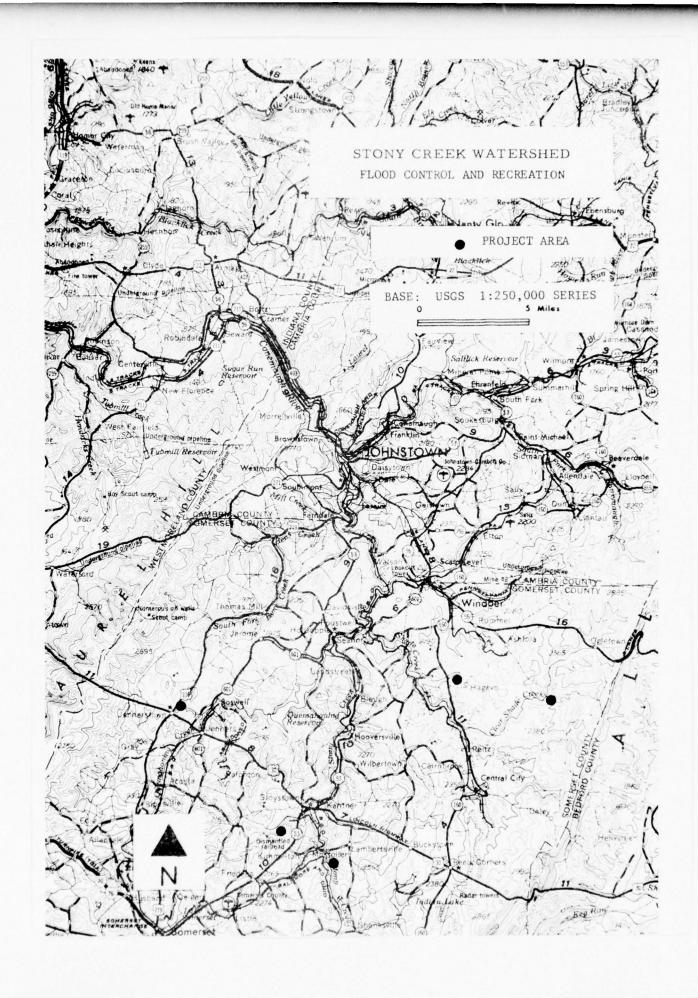
Wages and salaries to people used in construction, operation and maintenance is estimated at \$123,200 annually.

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As a result of the flood protection to be provided, foil Conservation Service Officials note that 1,603 jobs could result with a payroll of \$15,476,500 annually. They have computed a benefit-cost ratio for the project of 2.2:1.

5. CONTINUED COMPREHENSIVE WATER RESOURCES PLANNING

The need for continuing comprehensive water resources planning is apparent from the 230 projects listed in this Supplement (see Appendix G). Many require further study and justification from both the standpoint of need and their importance to economic and social development.

At the same time, coordination of projects among communities must be a basic and continuing concern. For example, the proposed water quality criteria which may soon be adopted by the Sanitary Water Board will no longer exempt communities from dumping sewage into acid streams. As a result, basin-wide disposal systems will be needed. Conceivably plans for these systems will be made at the same time state authorities are drawing plans to curb acid pollution, creating opportunities for coordination and economy.

Whether the concern is water quality, flood control or the development of an entire watershed, the interdependence of water resources projects has been repeatedly demonstrated. States, localities and Federal agencies have joint interests in many undertakings, such as this Supplement to the work of the U.S. Army Corps of Engineers for the Appalachian Regional Commission demonstrates.

In this Supplement, the economic development factor has been a primary concern. But the projects illustrate that economic development is dependent upon a variety of other actions. State Development Plans to be prepared by the Commonwealth of Pennsylvania will similarly emphasize the economic and social importance of additional water development projects.

These plans will be consistent with the decision of the Appalachian Regional Commission which unanimously recommended that water resources planning continue after completion of the Water Resources Plan by the Corps of Engineers in 1968.

This continuing activity will proceed within the context of the State Planning Program of the State Planning Board in the annual review, revision and preparation of the Appalachian Pennsylvania State Development Plan and in the formulation of the Comprehensive State Development Plan.

APPENDIX A

QUESTIONNAIRE

REGARDING WATER RESOURCES SURVEY

FOR APPALACHIA PENNSYLVANIA

Name	of	Developmen	nt Distric	t		 	
Name	of	County					
Name	of	person who	prepared Title	the	report	 	
Date	re	port was pr					

- 1. To what extent do problems associated with water and related resources at present retard economic growth in the county? Do you foresee that they will in the future?
- 2. In what way, and to what degree, can water resources development in the county alleviate these specific problems and provide the stimulus for economic growth?
- 3. How have these problems affected, or how may they later affect, the county's ability to attract new industry and commerce, or discourage the expansion of existing establishments? (Cite examples and estimate the resultant loss to the economy in terms of employment and income that would otherwise have been obtained.)
- 4. Are other resources and services in the county sufficiently developed to support economic growth so that the return on investment in water resources development will be maximized? If, for example, land were made free from flooding and developable land opened up for industrial sites as the result of a flood control project, could other industrial requirements such as local highway access, rail spurs, electric and gas utilities, water supply, wastes disposal, and manpower requirements be met? (Do not answer simply "yes" or "no." Be specific with your answer).
- 5. What specific water resources projects do you recommend for the county?
- 6. Since economic growth is in many ways related to urbanization, what urban centers would be socially and economically benefitted by water resources development projects in the county?
- 7. What are the relationships between each of the proposed water resources projects and other projects in the county that are planned or have been undertaken to promote economic growth?

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8. If water related recreational opportunities could be provided in these proposed water resources projects, would the recreational opportunities thus provided help promote the economic growth of the county? Would they help provide the inducements to good living likely to be sought by the employees of industries which might locate in the county?

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APPENDIX B*

PENNSYLVANIA STATE SUPPLEMENT TO THE CORPS OF ENGINEERS COMPREHENSIVE
PLAN FOR THE DEVELOPMENT AND EFFICIENT UTILIZATION OF THE WATER AND

RELATED RESOURCES OF THE APPALACHIAN REGION

- Statement of the water resources policies, planning responsibilities, and goals.
- Plans, problems and problem areas, present and future, by type (control of floods, regulation of rivers to enhance their value as sources of water supply for industrial and municipal development, generation of hydroelectric power, prevention of water pollution by drainage from rivers, enhancement of the recreation potentials, improvement of the rivers for navigation, conservation and efficient utilization of the land resource, soil treatment and land conservation, etc.)
- Operational and planning principles, criteria, standards, and guidelines.
- 4. List of projects and their justification and priorities.

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^{*}This questionnaire was distributed to each representative on the State Water Resources Coordinating Committee. Agencies represented on the Committee are: the Department of Agriculture, Department of Commerce, Pennsylvania Fish Commission, Department of Forests and Waters, Pennsylvania Game Commission, Department of Health, Department of Highways, Department of Internal Affairs, Department of Mines and Mineral Industries, and the Pennsylvania State Planning Board.

APPENDIX C

STATE PARKS AND FEDERAL RECREATION AREAS

STATE PARKS

County	Existing	Proposed
Allegheny	Point	
Armstrong	Crooked Creek	Buffalo Creek (pt)
Beaver	Raccoon Creek	
Bedford	Blue Knob	
	Shawnee	
	Warriors Path	
Berks	French Creek	Blue Marsh
		Maiden Creek
Blair		Canoe Creek
Bradford		Bradford County
Bucks	Ralph Stover	Neshaminy
	Roosevelt	Nockamixon
	Washington Crossing	Tyler Estate
Butler		Buffalo Creek (pt)
		Moraine
Cambria	Prince Gallitzin	
Cameron	Sinnemahoning	
Carbon	Hickory Run	Aquashicola
		Beltsville
		Lehigh River Gorge
Centre	Black Moshannon	Blanchard
	Poe Valley	
Chester	Valley Forge	Brandywine (Icedale)
		Marsh Creek
Clarion	Cook Forest	
Clearfield	Curwensville	
020111020	Parker Dam	
	S. B. Elliott	
Clinton	Bucktail	
V22	Hyner Run	
	Kettle Creek	
	Ravensburg	
Crawford	Pymatuning	
Cumberland	Colonel Denning	Cumberland County
	Pine Grove Furnace	
Dauphin		Dauphin County
Delaware	Brandywine Battlefield	Delaware County
		Jeffords Estate
Elk	Bendigo	
	Elk	
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County	Existing	Proposed
Erie	Presque Isle	Elk Creek
Fayette		Ohiopyle
		Sandy Creek
Franklin	Buchanan's Birthplace	Jan 2, 51552
	Caledonia	
	Mont Alto	
Fulton	Cowans Gap	
Greene	Ryerson Station	
Huntingdon	Greenwood Furnace	
	Trough Creek	
	Whipple Dam	
Indiana	whippie Dam	Conemaugh Gorge
Indiana		Yellow Creek
Jefferson	Clear Creek	relion creek
Lackawanna	Archbald Pothole	Samenton Furnaces
Lackawaiiiia	Archoard Potnote	Scranton Furnaces Tunkhannock Creek
Imagetow	Cuganahannaala	Tunknannock Creek
Lancaster	Susquehannock McConnell's Mill	
Lawrence		
Lebanon	Memorial Lake	Swatara Gap
Lehigh	D	Trexler
Luzerne	Bear Creek	Francis Slocum
	Ricketts Glen	Nescopeck
		Wapwallopen
Lycoming	Little Pine	
	Susquehanna	
McKean		Kinzua Bridge
Mercer		Sandy Creek
Mifflin Monroe	Reed's Gap Big Pocono	
Monroe	Gouldsboro	
	Tobyhanna	
Montgomery Northampton	Fort Washington	Evansburg
		Jacobsburg
Northumberland		Sunbury Access
Perry	Big Spring	Little Buffalo Creek
Philadelphia	Independence Mall	
Pike	Promised Land	
	George W. Childs	
Potter	Denton Hill	
	Lyman Run	
	Ole Bull	
	Sizerville	
Schuylkill		Locust Lake
		Tuscarora
Snyder	Snyder-Middleworth	
Somerset	Kooser	Laurel Ridge
	Laurel Hill	
Sullivan	Worlds End	
Susquehanna		Meshoppen

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County	Existing	Proposed
Tioga	Colton Point	
8-	Hills Creek	
	Leonard Harrison	
Union	R. B. Winter	
	Shikellamy	
Venango		Oil Creek Gorge
Varren	Chapman	
Washington		Washington County
Nayne	Prompton	
Westmoreland	Keystone	
	Laurel Mountain	
	Linn Run	
York	Gifford Pinchot	Codorus Creek
	Sam S. Lewis	
	FEDERAL RECREATION AREAS	
County	Existing	Proposed (major only)
Adams	Gettysburg Battlefield	
	National Park	
Armstrong	Crooked Creek Reservoir	
	Mahoning Creek Reservoir	
	(pt)	
Berks	Hopewell Village National	
	Historical Site	
Cambria	Allegheny Portage Nation-	
	al Historical Site	
Clinton	Kettle Creek Reservoir	
Elk	East Branch Clarion River	
	Reservoir	
Fayette	Fort Necessity National	
n1	Battlefield	
Forest	Tionesta Creek Reservoir	Davidtor Posanio
Huntingdon	Company Direct Description	Raystown Reservoir
Indiana	Conemaugh River Reser- voir (pt)	
	Mahoning Creek Reser- voir (pt)	

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F.E. Walter Reservoir

Independence National Historical Park Allegheny River Reservoir (pt)
Tocks Island Reservoir

Tocks Island Reservoir

(pt)

(pt)

Luzerne

McKean

Monroe

Pike

Philadelphia

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County	Existing	Proposed (major only)
Somerset	Youghiogheny River Reservoir	
Warren		Allegheny River Reser- voir (pt)
Wayne	Prompton Reservoir	
Westmoreland	Conemaugh River Reser- voir (pt)	
	Loyalhanna Reservoir	

NOTE: (pt) indicates that a facility is located in more than one county.

APPENDIX D

WATER RESOURCE DEVELOPMENT PROJECTS IN APPALACHIA

(Constructed, Under Construction, Or Funds Allocated for Construction)

County	Location or Project Name	Type(1)	Agency(1)
Allegheny	Carnegie	LFP	FW
zegen	Chartiers Creek (pt)	LFP	CE
	Tarentum	LFP	CE
	Turtle Creek	LFP	CE
	Allegheny River Locks & Dams (3)	N	CE
	Monongahela River Navigation Project		
	Lock and Dam	N	CE
	Ohio River Navigation ProjectLocks & Dams (2)	N	CE
Armstrong	Crooked Creek	R	CE
Armstrong	Mahoning Creek	R	CE
		LFP	CE
	Kittanning Allegheny River Locks & Dams (5)	N	CE
D	Raccoon Park Dam	R	FW
Beaver		LFP	FW
	Darlington		CE
D = 1.0 = 1	Ohio River Navigation ProjectLock & Dam		CE
Bedford	Raystown (pt)	R	FW
	Shawnee Dam	R	
	Everett	LFP	FW
Blair	Canoe Creek Dam	R	FW
Bradford	Athens	LFP	FW
	Sayre	LFP	FW
Butler	Moraine Park Dam	R	FW
	Butler	LFP	CE
Cambria	Glendale Dam	R	FW
	Barnesboro	LFP	FW
	Johnstown	LFP	CE
	Patton	LFP	FW
	Wilmore	LFP	CE
Cameron	George B. Stevenson Dam	R	FW
	Emporium	LFP	FW
Carbon	Aquashicola (pt)	R	CE
	Beltzville	R	CE
	Francis Walter (pt)	R	CE
	Weissport	LFP	FW
	Little Schuylkill River (pt)	W	SCS
	Mauch Chunk Creek (pt)	W	SCS
Centre	Black Moshannon Dam	R	FW
	Blanchard	R	CE
	Milesburg	LFP	FW
	Philipsburg	LFP	FW

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County	Location or Project Name	Type(1)	Agency(1)
Clarion	None		
Clearfield	Curvensville	R	CE
	DuBois	LFP	CE
	Irvona	LFP	FW
Clinton	Kettle Creek	R	CE
	Lock Haven Dam	R	FW
Columbia	Briar Creek (pt)	W	SCS
Crawford	Muddy Creek	R	CE
	Woodcock	R	CE
	Pymatuning Dam	R	FW
	Canadohta Lake	R	FW
	Meadville	LFP	FW
	Titusville	LFP	FW
	Little Shenango (pt)	W	SCS
	Mill Run	W	SCS
	Oil Creek	W	SCS
	Sandy Creek (pt)	W	SCS
Elk	East Branch Clarion River	R	CE
EIK	Johnsonburg	LFP	CE
		LFP	CE
Dad a	Ridgway	R	CE
Erie	Union City	LFP	CE
	Presque Isle	LFP	FW
	Wesleyville	LHI	CE
	Elk Creek		
	Erie	LHI	CE
Fayette	Youghiogheny River (pt) Monongahela River NavigationLocks	R	CE
	and Dams (4)	N	CE
	Dunlap Creek	W	SCS
Forest	Tionesta	R	CE
Fulton	None		
Greene	Ryerson Station Dam	R	FW
orcome	Monongahela River NavigationLocks		
	and Dams (2)	N	CE
	Wheeling Creek (pt)	W	FW
Huntingdon	Raystown (pt)	R	CE
nuncinguon	Huntingdon-Smithfield	LFP	FW
Indiana	Conemaugh River (pt)	R	CE
Indiana	Yellow Creek Dam	R	FW
	Cherry Tree	LFP	FW
Jefferson		LFP	FW
Jellerson	Brockway	LFP	CE
	Big Run	LFP	CE
	Brookville	LFP	CE
	Punxsutavney		
	Reynoldsville	LFP	CE
	Sykesville	LFP	CE
Juniata	None		

County	Location or Project Name		Type(1)	Agency (1)
Lackawanna	Aylesworth Creek		R	CE
	Fall Brook		R	CE
	Tunkhannock Creek Dam		R	FW
	Mayfield		LFP	FW
	Moosic		LFP	FW
	Olyphant		LFP	FW
	Scranton		LFP	CE
	Scranton		LFP	FW
Lawrence	McConnells Mill		R	FW
Luzerne	Francis Walter (pt)		R	CE
	Francis Slocum Dam		R	FW
	Duryea		LFP	FW
	Kingston-Edwardsville		LFP	CE
	Mocanaqua		LFP	FW
	Plymouth		LFP	CE
	Plymouth		LFP	FW
	Swoyersville-Forty Fort		LFP	CE
	Wilkes-Barre-Hanover Twp.		LFP	CE
	Wyoming		LFP	FW
	Briar Creek (pt)		W	scs
Lycoming	Little Pine Creek Dam		R	FW
Lycoming	Williamsport		LFP	CE
McKean	Allegheny (pt)		R	CE
McKean	Bradford		LFP	CE
	Smethport		LFP	FW
Manage	를 하셨다면 하는 것이 <mark>국</mark> 민이를 하셨다면 하면 하는 것이 되었다. 그는 것이 없는 것이 없는 것이 없는 것이 없다면 하는 것이다. 그런 것이 없는 것이다. 그런 것이다면 없는 것이다면 없다면 없다면 다른 것이다면 없다면 없다면 없다면 없다면 없다면 없다면 없다면 없다면 없다면 없		R	CE
Mercer	Shenango River		LFP	FW
	Hogback Run		W	SCS
	Little Shenango (pt)		W	SCS
	Sandy Creek (pt)		W	SCS
W. 001 ! -	Saul-Mathay	•	W	303
Mifflin	None	Ŷ	B	CE
Monroe	Aquashicola (pt)		R	
	Tocks Island (pt)		R	CE
	Stroudsburg		LFP	FW
	Brodhead Creek (pt)		W	SCS
	Greene-Dreher (pt)		W	SCS
Montour	Danville		LFP	FW
Northumberland	Sunbury Dam (pt)		R	FW
	Milton		LFP	FW
	Sunburry		LFP	CE
Perry	Little Buffalo Creek Dam		R	FW
Pike	Tocks Island (pt)		R	CE
	Greene-Dreher (pt)		W	SCS
Potter	Galeton Fiber Dam		R	FW
	Lyman Run Dam		R	FW
	Ole Bull Run		R	FW
	Coudersport		LFP	FW
	Genesee		LFP	FW
	North Fork Cowanesque River		W	SCS

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County	Location or Project Name	Type(1)	Agency(1)
Schuylkill	Locust Creek Dam	R	FW
	Locust Lake	R	FW
	McAdoo	LFP	FW
	Little Schuylkill River (pt)	W	SCS
	Mauch Chunk Creek (pt)	W	SCS
Snyder	Sunbury Dam (pt)	R	FW
	Middle Creek	W	SCS
Somerset	Youghiogheny River	R	CE
	Laurel Hill Dam	R	FW
	Boynton	LFP	FW
	Confluence	LFP	FW
	Rockwood	LFP	FW
	Windber	LFP	FW
Sullivan	None		
Susquehanna	Stillwater	R	CE
	Martin Creek	W	SCS
Tioga	Cowanesque	R	CE
	Tioga-Hammond	R	CE
	Elkland	LFP	CE
	Tioga	LFP	FW
	Marsh Creek	W	SCS
	Mill Creek	W	SCS
	North Fork Cowanesque River (pt)	W	SCS
Union	Sunbury Dam (pt)	R	FW
Venango	Oil City	LFP	CE
Warren	Allegheny (pt)	R	CE
	Warren	LFP	FW
Washington	Burgettstown	LFP	CE
	Chartiers Creek (pt)	LFP	CE
	Chartiers	LFP	FW
	Granville	LFP	CE
	Washington	LFP	CE
	Slovan	LFP	CE
	Monongahela River Navigation Project		
	Locks and Dams (3)	N	CE
	Harmon Creek	W	SCS
	Wheeling Creek (pt)	W	SCS
Wayne	General Edgar Jadwin	R	CE
	Prompton	R	CE
	Hawley	LFP	FW
	Newfoundland	LFP	FW
	White Mills	LFP	FW
	Honesdale	LFP	FW
	Greene-Dreher (pt)	W	SCS
	Lackawaxen Tributaries	W	SCS

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County	Location or Project Name	Type (1)	Agency (1)
Westmoreland	Bull Run Dam	R	FW
	Conemaugh River (pt)	R	CE
	Loyalhanna	R	CE
	Greensburg	LFP	FW
	Jeannette	LFP	FW
	Latrobe	LFP	CE
	Allegheny River Lock and Dam Monongahela River Navigation Project	N	CE
	Lock and Dam	N	CE
Wyoming	None		

NOTE: (1) Type: R - Reservoir

LFP - Local Flood Protection Project

N - Navigation Project

LHI - Local Harbor Improvement

W - Watershed Development Project

Agency: CE - U. S. Army Corps of Engineers

FW - Pennsylvania Department of Forests and

Waters

SCS - U. S. Soil Conservation Service

(pt) Indicates that a facility or project is located in more than one county.

APPENDIX E

MAP TITLES AND SOURCES

- Map 1: APPALACHIA DISTRICTS
 Source: Pennsylvania Department of Commerce and U.S. Army
 Corps of Engineers.
- Map 2: PHYSIOGRAPHIC AREAS
 Source: "Physiographic Provinces of Pennsylvania", (Map)
 Topographic and Geologic Survey, Pennsylvania
 Department of Internal Affairs.
- Map 3: MAJOR DRAINAGE BASINS
 Source: "Stream Map of Pennsylvania", 1965, Pennsylvania
 State University.
- Map 4: GENERALIZED AGRICULTURAL AND FOREST AREAS
 Source: "1964 Annual Summary", C.R.S. 30, Crop Reporting
 Service, Pennsylvania Department of Agriculture.
- Map 5: GENERALIZED MAJOR COAL, GAS AND OIL FIELDS

 Source: Generalized from "Oil and Gas Fields of Pennsylvania" (Map) and "Coal Fields of Pennsylvania" (Map), Topographic and Geologic Survey, Pennsylvania Department of Internal Affairs.
- Map 6: EARLY SETTLEMENT PATTERN
 Source: Pennsylvania State Planning Board.
- Map 7: HIGHWAYS FOR APPALACHIA
 Source: "1966 Estimates of Cost for Improving Inadequate
 Segments of the Appalachian Highway System in the
 Commonwealth of Pennsylvania", Pennsylvania Department of Highways.
- Map 8: PROJECTED TRAFFIC FLOW ON APPALACHIAN CORRIDORS

 Average Daily Traffic 1975

 Source: "1966 Estimates of Cost for Improving Inadequate

 Segments of the Appalachian Highway System in the

 Commonwealth of Pennsylvania", Pennsylvania Department of Internal Affairs.
- Map 9: ONE HOUR DRIVING DISTANCE FROM SMSA CENTRAL CITIES Source: Pennsylvania State Planning Board.

Map 10: POPULATION DENSITY - 1960 By Minor Civil Division

Source: "The Population of Pennsylvania: A Social Profile" - 1963, Pennsylvania State Planning Board.

Map 11: MANUFACTURING EMPLOYMENT - 1965

By Minor Civil Division

Source: 1965 County Industry Reports, Bureau of Statistics, Pennsylvania Department of Internal Affairs.

Map 12: POPULATION SHIFT - 1960-1965

By Appalachian Districts

Source: U. S. Bureau of Census (1960 population) and Pennsylvania State Planning Board (1965 population estimates).

Map 13: POPULATION SHIFT - 1960-1965

By Appalachian Counties

Source: U. S. Bureau of Census (1960 population) and Pennsylvania State Planning Board (1965 population estimates).

Map 14: SMSA POPULATION PROJECTIONS - 1975

Source: "Economic and Demographic Projections for Two Hundred and Twenty-four Metropolitan Areas", Vol. III, 1967, National Planning Association, Washington, D. C.

Map 15: SMSA EMPLOYMENT PROJECTIONS - 1975

Source: "Economic and Demographic Projections for Two Hundred and Twenty-four Metropolitan Areas", Vol. I, 1967, National Planning Association, Washington, D. C.

Map 16: GENERALIZED ECONOMIC AND RECREATIONAL IMPACT AREAS Source: Pennsylvania State Planning Board.

Map 17: PATTERN OF URBAN RECREATIONAL FLOW

Source: "Master Plan for the Pennsylvania State Park System", 1966, Fahringer, McCarty, Grey and Associates, Monroeville, Pennsylvania.

Map 18: SCHEMATIC GROWTH PATTERN

Source: Pennsylvania State Planning Board.

Map 19: MAJOR FLOOD PROBLEM AREAS IN APPALACHIA

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Source: Water Resource Branch, Pennsylvania Department of Forests and Waters.

Map 20: ACID MINE DRAINAGE POLLUTION

Source: Division of Sanitary Engineering, Bureau of Environmental Health, Pennsylvania Department of Health.

Map 21: MAJOR WATER QUALITY PROBLEM AREAS

Resulting from Sewage and Biodegradable Industrial Wastes
Source: Division of Sanitary Engineering, Bureau of Environmental Health, Pennsylvania Department of
Health.

Map 22: UNRECLAIMED STRIP MINING LAND - 1965

Source: Pennsylvania Department of Mines and Mineral Industries.

Map 23: WATER IMPOUNDMENT NEEDS FOR BOATING - 1980

Source: Based upon "A Report on Outdoor Recreation Demand, Supply and Needs in Appalachia" 1967, Bureau of Outdoor Recreation, U. S. Department of the Interior.

Map 24: STATE PARK ANNUAL ATTENDANCE PROJECTIONS - 1980

By State Planning Board Regions

Source: "Statewide Outdoor Recreation Plan", 1966, Pennsylvania State Planning Board.

Map 25: EXISTING AND PROPOSED PARKS AND RECREATION AREAS

Source: "Statewide Outdoor Recreation Plan", 1966, Pennsylvania State Planning Board.

Map 26: WATER RESOURCE DEVELOPMENT PROJECTS

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Source: Water Resource Branch, Pennsylvania Department of Forests and Waters.

Map 27: PROPOSED WATER RESOURCE DEVELOPMENT PROJECTS

Source: Pennsylvania State Planning Board in collaboration with State agencies, Appalachia Local Development Districts and U.S. Army Corps of Engineers, U.S. Soil Conservation Service, and Port Officials.

PROJECT MAPS

- Project A: LACKAWANNA RIVER SUSQUEHANNA RIVER MINE DRAINAGE ABATEMENT Source: Pennsylvania Department of Health.
- Project B: SEWICKLEY CREEK WATERSHED FLOOD PROTECTION AND WATER SUPPLY Source: Soil Conservation Service, U.S. Department of Agriculture and Pennsylvania Department of Agriculture.
- Project C: OTOCSIN RESERVOIR AND RECREATION AREA
 Source: Pennsylvania Department of Forests and Waters.
- Project D: SECHLER'S RUN FLOOD PROTECTION
 Source: Pennsylvania Department of Forests and Waters.
- Project E: CLARION RIVER BASIN MINE DRAINAGE ABATEMENT Source: Pennsylvania Department of Health.
- Project F: CASSELMAN RIVER MINE DRAINAGE ABATEMENT
 Source: Pennsylvania Department of Health.
- Project G: UPPER WEST BRANCH SUSQUEHANNA RIVER MINE DRAINAGE ABATEMENT Source: Pennsylvania Department of Health.
- Project H: CONNOQUENESSING CREEK WATERSHED FLOOD CONTROL, WATER SUPPLY AND RECREATION

 Source: Soil Conservation Service, U.S. Department of Agriculture and Pennsylvania Department of Agriculture.
- Project I: RACCOON CREEK RESERVOIR
 Source: U.S. Army Corps of Engineers and Pennsylvania
 Department of Forests and Waters.
- Project J: PORT OF ERIE DREDGING
 Source: Port Commission, City of Erie, and Pennsylvania
 Department of Commerce.
- Project K: NATUREALM CONSERVATION EDUCATION AREA
 Source: Pennsylvania Department of Forests and Waters.
- Project L: ABRAHAM'S CREEK FLOOD PROTECTION

 Source: Pennsylvania Department of Forests and Waters.
- Project M: SAM'S RUN FLOOD PROTECTION
 Source: Pennsylvania Department of Forests and Waters.
- Project N: BIG SANDY CREEK RESERVOIR
 Source: U.S. Army Corps of Engineers and Pennsylvania
 Department of Forests and Waters.

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Project 0: UPPER LOYALHANNA CREEK WATERSHED - FLOOD CONTROL, WATER SUPPLY AND RECREATION

Source: Soil Conservation Service, U.S. Department of Agriculture and Pennsylvania Department of Agriculture.

Project P: TIOGA-HAMMOND RESERVOIR AND MINE DRAINAGE ABATEMENT Source: U.S. Army Corps of Engineers and Pennsylvania Department of Health.

Project Q: STONY CREEK WATERSHED - FLOOD CONTROL AND RECREATION

Source: Soil Conservation Service, U.S. Department of Agriculture and Pennsylvania Department of Agriculture.

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APPENDIX F

WATER RESOURCES DEVELOPMENT PROJECTS

Proposed by Appalachia Pennsylvania Counties, Local Development Districts, Commonwealth Agencies, Port Officials, U.S. Army Corps of Engineers, Bureau of Outdoor Recreation, and Soil Conservation Service.

Listed by Local Development Districts and County

NORTHEAST DEVELOPMENT DISTRICT - CARBON COUNTY

NAME: Abatement of acid mine drainage on Lehigh River. FUNCTION: Water Quality. EST. COST --

NAME: U.S. Corps dams in Delaware River Basin Plan - A. Beltsville; B. Aquashicole; C. Francis Walter enlargement. FUNCTION: Water Supply. EST. COST --

NAME: Water and Sewer System for Panther Valley School (extension from Lansford). FUNCTION: Water Supply, Water Quality. EST COST --

NAME: Mauch Chunk Dam. -- S.C.S. -- May supply water for Industrial Park. FUNCTION: Water Supply. EST. COST --

PIKE COUNTY

NAME: Study ground water supply to determine availability. FUNCTION: Water Supply, Conservation. EST. COST --

MONROE COUNTY

NAME: Modernize E. Stroudsburg Water System. FUNCTION: Water Supply. EST. COST --

NAME: Provision for more water-based recreation facilities. FUNCTION: Recreation. EST. COST --

NAME: Study of other projects on Pocono Creek and Broadhead Creek under S.C.S. program. FUNCTION: Flood Control, Recreation. EST. COST --

NAME: Construction of Impoundments on S.C.S. Upper Broadhead Creek Project. FUNCTION: Flood Control, Recreation. EST. COST --

NAME: Restoration of Tobyhanna Dam #2. FUNCTION: Flood Control, Recreation. EST. COST --

NAME: Creation of a County Municipal Authority--to build water and sewer systems, in accordance with County Plan. FUNCTION: Water Supply, Water Quality. EST. COST --

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LACKAWANNA COUNTY

NAME: Series of County parks: @ - Mountain Mud Pond - Bell Mountain - West Mountain - Covington Lakes. FUNCTION: Recreation. EST. COST --

LUZERNE COUNTY

NAME: Recommend Corps Study for development of sewage system for: Harvey's Lake; Black Mountain; Mountain Top. FUNCTION: Water Quality. EST. COST --

NAME: Water Supply for Suburban development west of Wilkes-Barre (serving Wilkes-Barre, Pittston, Nanticoke, Hazleton). FUNCTION: Water Supply. EST. COST --

NAME: Sewage Treatment Plant for Wyoming Valley Sanitation Authority. FUNCTION: Water Quality. EST. COST --

NAME: Pollution abatement on Nescopeck Creek (lower section). FUNCTION: Water Quality. EST. COST --

NAME: Wyoming; West Wyoming in Greater Wilkes-Barre Area - Local Flood Protection; levee and channel improvements to alleviate flooding of industrial and commercial areas. FUNCTION: Flood Control. EST. COST: \$500,000.

NAME: Abatement of sanitary sewage pollution on the Lackawanna River. FUNCTION: Water Quality. EST. COST --

NAME: Entire Wyoming Valley Flood Control to protect industry. FUNCTION: Flood Control. EST. COST --

NAME: Reservoir and recreation facility on Wapwallopen Creek (U.S. Corps). FUNCTION: Recreation. EST. COST --

NAME: Abatement of acid mine pollution on the N. Branch Susquehanna River and Lackawanna River (Scranton-Wilkes-Barre Area) - pumps, treatment works, and land reclamation. FUNCTION: Water Quality, Recreation. EST. COST: \$68.2 million.

WAYNE COUNTY

NAME: Modification of Prompton Reservoir. FUNCTION: Water Supply, Recreation. EST. COST --

NAME: Study of water and sewer systems @ - Honesdale; Lake Ariel; New Foundland; Waymort; Hamlin. FUNCTION: Water Supply, Water Quality. EST. COST --

SCHUYLKILL COUNTY

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NAME: Water Tank for Industrial Park at Frackville. FUNCTION: Water Supply. EST. COST --

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NAME: Water supply and waste disposal for new Industrial Parks. FUNC-TION: Water Supply, Water Quality. EST. COST --

NAME: Acid Mine Drainage abatement - A. Tamaqua; B. Mahonoy City - Mahonoy Cr.; C. Shenandoah. FUNCTION: Water Quality, Recreation. EST. COST --

NAME: Restoration of Deer Lake Reservoir at Deer Lake Boro. FUNCTION: Water Supply, Water Quality, Recreation. EST. COST --

NAME: Tamaqua Local Protection Project (relocate Wabash Cr. channel from business district of Tamaqua). FUNCTION: Flood Control. EST. COST --

NORTHERN TIER DEVELOPMENT DISTRICT - SUSQUEHANNA COUNTY

NAME: Water Supply facilities situated at: Dimock, Dundaff, S. Monntrose, Springville, Crystal Lake - needed now. Clifford, Elkdale, Montrose - needed in future. FUNCTION: Water Supply. EST. COST --

NAME: Conservation of natural resources for fish, wildlife conservation (Salt Spring Area). FUNCTION: Conservation. EST. COST --

NAME: Water recreation - Area, Montrose vicinity. FUNCTION: Recreation. EST. COST --

NAME: Drinker Creek Project for flood control. FUNCTION: Flood Control. EST. COST --

NAME: Martin Creek Dam near Hopbottom and Clifford - near Rt. 81. FUNC-TION: Flood Control. EST. COST --

NAME: Recreation impoundment and State Park, on Meshoppen Creek, S. of Springville. FUNCTION: Recreation. EST. COST --

SULLIVAN COUNTY

NAME: Water Supply Facility at Dushore. FUNCTION: Water Supply. EST. COST --

NAME: Erect sewage facilities at: Dushore, Laporte, Lopez, Mildred, Forksville. FUNCTION: Water Quality. EST. COST --

NAME: Flood control projects on: Muncy Creek, Hunters Lake-Muncy Valley, Spring Run, Lopez, Little Loyalsock Creek. FUNCTION: Flood Control. EST. COST --

NAME: Abatement of acid on Loyalsock between World's End State Park and Lopez. FUNCTION: Water Quality. EST. COST --

NAME: U.S. Army Corps of Engineers project, 2.5 miles above World's End State Park. FUNCTION: Recreation. EST. COST --

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NAME: Recreation ponds and lakes throughout County. FUNCTION: Recreation. EST. COST --

TIOGA COUNTY

NAME: Distribution of water from Tioga - Hammond Dam to serve Blossburg to Mansfield. FUNCTION: Water Supply. EST. COST --

NAME: Reservoirs needed in future @ Red House, Buckly Hollow. FUNCTION: Water Supply. EST. COST --

NAME: Sewage treatment systems needed in future @ Blossburg, Lawrence-ville, Osceola, Elkland Area. FUNCTION: Water Quality. EST. COST --

NAME: Flood control projects in: Blossburg, Lawrenceville, Wellsboro. FUNCTION: Flood Control. EST. COST --

NAME: Water Supply facilities - a) Elkland; b) Lawrenceville; c) Tioga. FUNCTION: Water Supply. EST. COST --

NAME: Redwood Lake. FUNCTION: Recreation. EST. COST --

NAME: Tioga-Hammond Project - Dam and (U.S. Corps) abatement of mine drainage. FUNCTION: Flood Control, Recreation, Water Quality. EST. COST: \$64,750,000 total.

BRADFORD COUNTY

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NAME: Water Supply and sewage disposal plants <u>presently</u> needed at: N. Towanda, Wysox, Canton, Ulster, Bentley Creek, Gillett, Mosherville. FUNC-TION: Water Supply, Water Quality. EST. COST --

NAME: Water Supply and sewage disposal plants needed at: Laceyville, Camptown, Rome, E. Smithfield, Columbia, Cross Roads, Austinville, Burlington, New Albany. FUNCTION: Water Supply, Water Quality. EST. COST --

NAME: Flood control and low floor augmentation on: a) Wysox Creek; b) Wyalusing Creek; c) Wopposening Creek; d) South Creek. FUNCTION: Flood Control, Water Quality. EST. COST --

NAME: Sugar Creek and Bentley Creek flood control projects. FUNCTION: Flood Control. EST. COST --

NAME: Enforcement of anti-pollution laws, especially on Susquehanna River. FUNCTION: Water Quality. EST. COST --

NAME: Sewage Treatment Plant @ N. Towanda. FUNCTION: Water Quality. EST. COST --

NAME: Reservoirs throughout County. Specific sites proposed on: a) Big Tuscorora Creek; b) Skrader Creek. FUNCTION: Recreation. EST. COST --

NAME: Flood Control on Susquehanna River. FUNCTION: Flood Control. EST. COST --

WYOMING COUNTY

NAME: Flood protection Dike - on Mehoopany Creek in Foristan Twp. FUNC-TION: Flood Control. EST. COST --

NAME: Future Water Supply System @ Tunkhannock. FUNCTION: Water Supply. EST. COST --

NAME: New Water Supply Systems @ a) Nicholson; b) Factoryville; c) Meshoppen. FUNCTION; Water Supply. EST. COST --

NAME: Conservation of Water Supply at Mehopony Area of Charmin Factory. FUNCTION: Conservation. EST. COST --

NAME: Water Impoundment on Mehoopany Creek, Foriston Twp. FUNCTION: Flood Control. EST. COST --

NAME: State Park anywhere in County. FUNCTION: Recreation. EST. COST --

NAME: Reservoir and recreation facility on Meshoppen Creek (U.S. Corps). FUNCTION: Recreation. EST. COST --

CENTRAL SUSQUEHANNA DEVELOPMENT DISTRICT - CENTRE COUNTY

NAME: Mine drainage abatement on Beech Creek (N. Central Centre Co. and S. Border of Clinton Co.). FUNCTION: Water Quality. EST. COST --

NAME: Construction of Dam on Sayers Creek. FUNCTION: Water Supply, Recreation. EST. COST --

NAME: Expansion and modernization of Fish Hatchery at Bellefonte. FUNC-TION: Recreation. EST. COST --

COLUMBIA COUNTY

NAME: Pollution abatement on the Susquehanna River. FUNCTION: Water Quality. EST. COST --

NAME: Additional water supply facilities at Bloomsburg, Berwick. FUNC-TION: Water Supply. EST. COST --

NAME: Flood Control projects along the Susquehanna River. FUNCTION: Flood Control. EST. COST --

NAME: Future study of the feasibility of the Green Creek potential recreation reservoir. FUNCTION: Recreation. EST. COST --

CLINTON COUNTY

NAME: Abatement of sewage and acid pollution on Susquehanna River. FUNCTION: Water Quality. EST. COST --

NAME: Watershed protection of Bald Eagle Creek, below Blanchard Dam. FUNC-TION: Conservation, Water Quality, Recreation, Water Supply. EST. COST --

JUNIATA COUNTY

NAME: Construction of a series of dams. FUNCTION: Recreation. EST. COST --

NAME: Further study of the recreation Cocolamus potential recreation reservoir site. S.C.S. 5 miles N. of Millerstown. FUNCTION: Recreation. EST. COST --

LYCOMING COUNTY

NAME: Lycoming Creek Watershed demonstration project. FUNCTION: Flood Control. Water Quality, Water Supply, Recreation. EST. COST --

NAME: Channel improvements on Susquehanna River. FUNCTION: Recreation. EST. COST. --

MIFFLIN COUNTY

NAME: Construction of S.C.S. dams throughout the County. FUNCTION: Conservation. EST. COST --

NAME: Juniata River - Development of portable dams below Lewistown. FUNC-TION: Recreation. EST. COST --

NAME: Construction of sewage treatment facilities above Lewistown. FUNC-TION: Water Quality. EST. COST --

MONTOUR COUNTY

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NAME: Flood Control on Sechler's Run at Danville. FUNCTION: Flood Control. EST. COST: \$1,150,000.

NAME: Recreation Lakes throughout the County. FUNCTION: Recreation. EST. COST --

NAME: Pollution abatement on Susquehanna River. FUNCTION: Water Quality. EST. COST --

NORTHUMBERLAND COUNTY

NAME: Pollution Control program on Susquehanna River. FUNCTION: Water Quality. EST. COST --

NAME: Recreation Reservoir at Montgomery Island near Milton. FUNCTION: Recreation. EST. COST --

NAME: Water Impoundment and distribution facilities. FUNCTION: Water Supply. EST. COST --

NAME: Water-oriented recreation facilities. FUNCTION: Recreation. EST. COST --

NAME: Flood Control in Northumberland County. FUNCTION: Flood Control. EST. COST --

NAME: Stream dredging and stream bank stabilization. FUNCTION: Conservation. EST. COST --

NAME: Sewage disposal facilities to reduce pollution. FUNCTION: Water Quality. EST. COST --

PERRY COUNTY

NAME: Impoundments for water supply. FUNCTION: Water Supply. EST. COST --

SNYDER COUNTY

NAME: Middle Creek Flood Control Project, completion of - 5 parts. FUNC-TION: Flood Control. EST. COST --

UNION COUNTY

NAME: Small holding dams on feeder streams; on watershed conservation. FUNCTION: Water Supply, Conservation, Flood Control. EST. COST --

NORTH CENTRAL DEVELOPMENT DISTRICT - POTTER COUNTY

NAME: Build new Fish Hatchery at Oswayo. FUNCTION: Recreation. EST. COST --

NAME: Oswayo Creek Watershed (5 structures) (S.C.S.). FUNCTION: Flood Control, Recreation. EST. COST: \$4,962,500.

NAME: Upper Allegheny River Watershed (7 structures) (S.C.S.). Central and W. Central Potter and E. Central McKean. FUNCTION: Flood Control, Recreation. EST. COST: \$6,362,800.

MCKEAN COUNTY

NAME: Potato Creek Watershed (3 structures) (S.C.S.). FUNCTION: Flood Control, Recreation. EST. COST: \$3,980,200.

JEFFERSON COUNTY

NAME: Impoundment on Trout Run. FUNCTION: EST. COST --

NAME: Comprehensive survey of water pollution and plan for elimination. (Countywide) FUNCTION: Water Quality. EST. COST --

NAME: Mahoning Creek Watershed (3 structures) (S.C.S.). FUNCTION: Flood Control, Recreation. EST. COST: \$5,005,000.

NAME: North Fork Reservoir (N. Central Jefferson Co. - N. Fork of Red Bank Creek) (U.S. Corps). FUNCTION: Flood Control, Water Supply, Water Quality. EST. COST --

NAME: Little Sandy Creek Reservoir (S.W. Jefferson Co.) U.S. Corps. FUNCTION: Flood Control, Water Supply, Water Quality. EST. COST. __

ELK COUNTY

NAME: Development of a major surface supply of water for St. Mary's Area. (Urban and Industrial water supply and recreation) FUNCTION: Water Supply, Recreation. EST. COST --

NAME: W. Branch Clarion River Watershed. (4 structures) Also affects McKean Co. S.C.S. FUNCTION: Water Supply, Flood Control, Recreation. EST. COST: \$4,751,200.

CLEARFIELD COUNTY

NAME: Sandy Lick Creek Watershed. Multi-purpose project in N.W. Clear-field Co., and over into Jefferson Co. S.C.S. FUNCTION: Flood Control, Water Supply, Recreation. EST. COST: \$5,602,100.

NAME: Federal aid to participate in reservoir construction at Otocsin. (Anderson Creek in North Fork) FUNCTION: Recreation. EST. COST: \$29 million (total)

NAME: Pollution abatement on Upper W. Branch of Susquehanna River and its tributaries above Curwensville Reservoir - Anderson Cr., Bear Run, and Upper W. Branch Susquehanna. FUNCTION: Water Quality. EST. COST: \$7.7 million.

FOREST COUNTY

NAME: Allegheny Forest Development (dams on small streams) FUNCTION: Recreation. EST. COST --

V-80-Pa

NORTHWEST DEVELOPMENT DISTRICT - WARREN COUNTY

NAME: Sewage facilities for communities of Sugar Grove, Clarendon, Tidioute. FUNCTION: Water Quality. EST. COST --

NAME: Raise Allegheny National Forest Development from \$1/2 million to \$1 million as originally planned. (Perhaps related to Forest Co. project) FUNCTION: Recreation. EST. COST --

NAME: Tionesta Creek Watershed (S.E. Warren Co., N.E. Forest Co., and S.W. McKean Co.) Entire project is in Allegheny National Forest; 10 miles from Warren. (5 structures) FUNCTION: Flood Control, Recreation. EST. COST: \$3,979,600.

NAME: Brokenstraw Creek Watershed (6 structures) N.W. Warren Co. - S.C.S. FUNCTION: Flood Control, Recreation. EST. COST: \$5,787,700.

NAME: Brokenstraw Creek Reservoir (U.S. Corps). FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

CLARION COUNTY

NAME: Acid-mine drainage abatement in Clarion River Basin. (Treatment plants and surface restoration) FUNCTION: Water Quality, Water Supply, Recreation. EST. COST: \$60 million

NAME: Clarion River Reservoir - Lower reaches of Clarion River at St. Petersburg (U.S. Corps). FUNCTION: Flood Control, Water Quality, Water Supply, Recreation. EST. COST: \$201 million.

NAME: Study of underground water supply. FUNCTION: Water Supply. EST. COST --

CRAWFORD COUNTY

NAME: Expansion and modernization of Fish Hatchery @ Linesville. FUNC-TION: Recreation. EST. COST --

NAME: Sugar Creek Watershed (2 structures) - S.E. Crawford and N.W. Venango. S.C.S. FUNCTION: Flood Control, Recreation, EST. COST: \$7,583,100.

NAME: Flood Plains Study in Meadville Area. (by Corps of Engineers) FUNC-TION: Flood Control. EST. COST --

NAME: Lake Cussewago - N.W. of Meadville. FUNCTION: Flood Control, Recreation. EST. COST --

LAWRENCE COUNTY

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NAME: Detailed Study of impoundments in abandoned strip mines. FUNCTION: Recreation. EST. COST --

V-81-Pa

NAME: Maintain and enhance Neshannock Creek for excellent trout fishing. FUNCTION: Recreation, Conservation. EST. COST --

NAME: Flood Control projects & Shenango River, Neshannock Creek, Connoquenessing Creek and Slippery Rock Creek. FUNCTION: Flood Control. EST. COST --

NAME: Initiate interstate pollution abatement program on Mahoning River. (S.W. Lawrence Co., and Ohio) FUNCTION: Water Quality. EST. COST --

MERCER COUNTY

NAME: Eliminate flood hazards on Neshannock Creek (reduce flooding in local New Castle). FUNCTION: Flood Control. EST. COST --

NAME: Accelerated development of recreation areas around Shenango River Reservoir. FUNCTION: Recreation. EST. COST --

NAME: Provide surface water storage for Industrial use. (At intersection of I-80 and 18-S of Farrell) FUNCTION: Water Supply. EST. COST --

NAME: Eliminate pollution on W. Branch of Wolf Creek (North of Grove City). FUNCTION: Water Quality. EST. COST --

NAME: Wolf Creek Project (S.C.S.) for water supply North of Grove City. FUNCTION: Water Supply. EST. COST --

NAME: Develop Impoundments near Interstate system--particularly Sandy Lake, Stoneboro, Mercer, London, and Grove City Areas. FUNCTION: Water Supply. EST. COST --

NAME: Dredging of Shenango River--below Sharon-Farrell area. FUNCTION: Flood Control. EST. COST --

NAME: Pollution abatement on Shenango River below Sharon. FUNCTION: Water Quality. EST. COST --

VENANGO COUNTY

NAME: Construction of multi-purpose dam on Two Mile Run. FUNCTION: Recreation. EST. COST --

NAME: Canalization of Allegheny River. FUNCTION: Recreation. EST. COST --

NAME: Pollution abatement on watersheds in S. part of County and watershed restoration on: Scrubgrass Creek, S. Sandy Cr., E. Sandy Cr. and Wolf Run. FUNCTION: Water Quality. EST. COST --

ERIE COUNTY

NAME: Erie Port Improvements (Erie Port Commission). FUNCTION: Port Improvements. EST. COST: \$5,878,000 (total).

NAME: LeBoeuf Creek Watershed - 10 miles from Erie (S.C.S.) FUNCTION: Recreation, Flood Control, Water Supply. EST. COST: \$4,188,000.

NAME: Upper French Creek Watershed (3 structures) - 20 miles from Erie - only small port in Penmsylvania, mostly in N.Y.--S.C.S. FUNCTION: Water Supply, Flood Control, Recreation. EST. COST: \$8,099,300.

NAME: Development of two (2) small boat harbors on Lake Erie. FUNCTION: Recreation. EST. COST --

TURNPIKE DEVELOPMENT DISTRICT - SOMERSET COUNTY

NAME: Flood Control Project (Myersdale Boro). FUNCTION: Flood Control EST. COST --

NAME: Construction of 2 million gal. reservoir, main lines, service lines, storage tank water treatment facilities (Paint Twp.). FUNCTION: Water Supply. EST. COST --

NAME: Building additional reservoir capacity, renewing and extending service lines, installation of water treatment facilities (Sipesville-Lincoln Twp.). FUNCTION: Water Supply. EST. COST --

NAME: Purchase of additional watershed acreage (Myersdale Boro). FUNC-TION: Water Supply. EST. COST --

NAME: Construction of water storage tank and remodeling of water treatment facilities (Jenners Twp.). FUNCTION: Water Supply. EST. COST --

NAME: Construction of additional reservoir capacity and extension of service lines (Jennerstown Boro) and installation of treatment plant. FUNC-TION: Water Supply. EST. COST --

NAME: Extension and remodeling of supply lines (Somerset Boro). FUNCTION: Water Supply. EST. COST --

NAME: Extension and remodeling of supply lines to out-lying areas (Gone-maugh Twp.). FUNCTION: Water Supply. EST. COST --

NAME: Wills Creek Watershed. E. Somerset and S.W. Bedford Counties. (S.C.S.) FUNCTION: Flood Control, Water Supply, Water Quality. EST. COST --

NAME: Upper Casselman River Reservoir -- In S. Central Somerset Co. (U.S. Corps) FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

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NAME: Laurel Hill Creek Dam Site - Laurel Hill Creek N. of Youghiogheny Reservoir - U.S. Corps. FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

NAME: Clear Shade Creek Reservoir - on Clear Shade Creek N.E. Somerset Co. U.S. Corps. FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

NAME: Upper Stony Creek Reservoir - Upper Stony Creek above Quemahoning Reservoir. (U.S. Corps) FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

NAME: Additional funds for mine drainage abatement work on Casselman River (Pa. Dept. of Health Project). FUNCTION: Water Quality. EST. COST: \$5-7 million.

CAMBRIA COUNTY

NAME: Sam's Run - at Johnstown. Repair and extension of channel improvements; protect residential and industrial areas. FUNCTION: Flood Control. EST. COST: \$320,000.

NAME: Elimination of stream pollution - tributaries of: W. Branch of Susquehanna, Clearfield Cr., Blacklick Cr., Conemaugh River, Little Conemaugh Cr., Stony Creek R., i.e., all major streams of County. FUNCTION: Water Quality. EST. COST --

NAME: Naturealm - in Prince Gallitzin State Park. FUNCTION: Conservation. EST. COST: \$9.5 million.

NAME: Collapsible dam on Conemaugh and Stony Creek Rivers @ Johnstown. FUNCTION: Recreation. EST. COST --

HUNTINGDON COUNTY

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NAME: Sediment control - Standing Stone Creek, Shavers Creek and Augwick Creek Watersheds. FUNCTION: Water Quality. EST. COST --

NAME: Channel improvement on Augwick Creek - near Mt. Union Airport along U.S. 522. FUNCTION: Flood Control. EST. COST --

NAME: Flood protection project - Huntingdon and Smithville Twps. FUNCTION: Flood Control. EST. COST --

NAME: Provision of treatment facilities by municipalities presently discharging waste water @ Alexandría, Petersburg, Mapleton, Orbisonia, and Huntingdon, Mt. Union. FUNCTION: Water Quality. EST. COST --

NAME: Provision of treatment facilities by industries presently discharging waste water. W. Virginia Pulp and Paper Co. (Tyrone (Blair County) and Williamsburg), B.D.M. Bare Paper Co., Roaring Springs (Blair Co.). FUNCTION: Water Quality. EST. COST --

V-84-Pa

NAME: Trough Creek Reservoir - on Trough Creek (S.W. Huntingdon Co.) FUNCTION: Water Quality, Recreation. EST. COST --

NAME: Huntingdon Reservoir - Standing Stone Creek. FUNCTION: Flood Control, Water Supply, Recreation, Water Quality. EST. COST --

NAME: Petersburg Reservoir on Shaver Creek - N. Central Huntingdon Co. FUNCTION: Flood Control, Water Supply, Recreation. EST. COST --

NAME: Orbisonia Reservoir on Augwick Creek - S. Huntingdon Co. FUNCTION: Flood Control, Water Supply, Recreation. EST. COST --

NAME: Completion of Raystown Reservoir. U.S. Corps. FUNCTION: Flood Control, Water Quality. EST. COST --

BEDFORD COUNTY

NAME: Water Supply in potential growth area. (Shakesspring Twp. between Bedford and Everett) FUNCTION: Water Supply. EST. COST --

NAME: Extension of water lines to serve new areas - incl. industrial park (Bedford Interchange area). FUNCTION: Water Supply. EST. COST --

NAME: Well drilling - Breezewood. FUNCTION: Water Supply. EST. COST --

NAME: S.C.S. feasibility study for flood control - Dunnings Creek Watershed. FUNCTION: Flood Control, Recreation, Conservation. EST. COST --

NAME: Clear Ridge Dam and 1500 acre Lake - Shavers Creek near Breezewood. FUNCTION: Recreation, Water. EST. COST --

BLAIR COUNTY

NAME: Sanitary sewage and sewage treatment throughout County in built-up areas. FUNCTION: Water Quality. EST. COST --

NAME: Dam on Canoe Creek. FUNCTION: Flood Control, Recreation. EST. COST --

NAME: Dredging and Stream clearance (throughout the County). FUNCTION: Flood Control, Water Quality. EST. COST --

NAME: Flood protection facilities @ Tyrone. FUNCTION: Flood Control. EST. COST --

NAME: Additional water supply and water quality control facilities @ Altoona City, Bellwood Boro, Tyrone Boro, Newry Boro. FUNCTION: Water Supply, Water Quality. EST. COST --

NAME: Flood Control Dam - Catfish area of Frankstown Branch. FUNCTION: Flood Control, Recreation. EST. COST --

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FULTON COUNTY

NAME: Treatment plant to replace on-lot disposal facilities @ Neidmore, Crystal Spring, and Warfordsburg. FUNCTION: Water Quality. EST. COST --

NAME: Sewage disposal facility at McConnellsburg on Big Cove Creek. FUNCTION: Water Quality. EST. COST --

NAME: Construction of low-flow augmentation reservoirs along major tributaries and headwater areas. FUNCTION: Water Supply, Water Quality. EST. COST --

SOMERSET COUNTY

NAME: Stony Creek Watershed, N. Somerset Co., and S. end of Cambria Co. 5 structures - S.C.S. FUNCTION: Flood Control, Recreation. EST. COST: \$7,851, 260.

SOUTHWESTERN DEVELOPMENT DISTRICT - WESTMORELAND COUNTY

NAME: Study of river depths and underwater problems affecting water recreational demand (Rostraver Twp.). FUNCTION: Recreation. EST. COST --

NAME: Investigation of methods needed to reduce acid-mine drainage in Loyalhanna Reservoir, and reconsideration of providing recreation facilities at reservoir. FUNCTION: Water Quality, Recreation. EST. COST --

NAME: Sewickley Creek Watershed, S.C.S. (2 structures) retarding structures and channel improvement - on I-70. FUNCTION: Flood Control, Water Supply. EST. COST: \$3,528,800.

NAME: Turtle Creek Watershed, S.C.S. (4 structures) between Jeannette in Westmoreland, and Braddock in Allegheny County. FUNCTION: Flood Control, Water Supply. Recreation. EST. COST: \$3.594.000.

NAME: Upper Loyalhanna Creek Watershed, S.C.S. (7 structures) 50 miles from Pittsburgh, 12 miles from Greensburg. In Ligonier-Latrobe Area. FUNCTION: Flood Control, Water Supply, Recreation. EST. COST: \$7.621.400.

NAME: Tubhill Creek Reservoir (U.S. Corps) W. of Johnstown, above Conemaugh Reservoir. FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

WASHINGTON COUNTY

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NAME: Development of a site for a marina at confluence of E. Pike Run and Monongahela River, (E. Washington Co.) across from California, Pa. FUNC-TION: Recreation. EST. COST --

NAME: Impoundment of Plum Run. FUNCTION: Recreation. EST. COST --

NAME: Impoundment on Buffalo Creek (W. central Washington County). FUNCTION: Recreation. EST. COST --

NAME: Investigation of water supply problems on Pigeon Creek and Little Chartiers Creek Basins. FUNCTION: Water Supply. EST. COST --

NAME: Increase water storage capacity of Raccoon Creek Basin (N.W. Washington Co.). FUNCTION: Water Supply. EST. COST --

NAME: Develop new methods of laying oil and gas pipe lines - study with recommendations. FUNCTION: Recreation. EST. COST --

NAME: Conduct feasibility study on Ten-Mile Creek Watershed (S. Washington Co.). FUNCTION: Water Supply, Recreation. EST. COST --

NAME: Initiate flood control project in Catfish Creek (unable to identify location). FUNCTION: Flood Control. EST. COST --

NAME: Conduct flood plain studies of Chartiers, Pigeon and Raccoon Creeks, and of Monongahela River. FUNCTION: Flood Control. EST. COST --

NAME: Rechannel Pigeon Cr. to permit its flood plain to be used for industrial purposes. (E. Washington Co.) Flows into Monongahela River. FUNC-TION: Flood Control. EST. COST --

NAME: Water Impoundment on Cross Creek. (Western Washington Co., near town of Cross Creek) FUNCTION: Water Supply, Flood Control, Recreation. EST. COST --

NAME: Multi-purpose impoundment on Ten-Mile Creek. (S.E. Washington Co.) FUNCTION: Flood Control, Water Supply, Recreation. EST. COST --

NAME: Conduct research into feasibility of collecting treated discharges from coal mines for general use. FUNCTION: EST. COST --

NAME: Research project to test feasibility of developing dams and reservoirs over mined-out areas. FUNCTION: Water Quality, Recreation. EST. COST --

NAME: Initiate flood control project on Chartiers Creek (Between Washington and Canton Twps., Canonsburg and Houston). FUNCTION: Flood Control. EST. COST --

NAME: Construction of Stonewall Jackson and Rowlsburg Reservoirs (authorized) in West Virginia and 23 smaller reservoirs on various tributaries to the Monongahela River. (U.S. Corps) FUNCTION: Flood Control. EST. COST --

NAME: Raccoon Creek Watershed (S. Beaver and N. Washington) S.C.S. FUNC-TION: Flood Control, Recreation, Water Supply. EST. COST: \$1,921,800.

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NAME: Raccoon Creek Reservoir (S. Beaver and N. Washington Co.'s) (U.S. Corps). FUNCTION: Flood Control, Water Quality, Water Supply, Recreation. EST. COST: \$35 million est. includes acid stream abatement and strip mine reclamation.

NAME: Impoundment on Brush Creek. FUNCTION: Recreation, Flood Control. EST. COST --

ALLEGHENY COUNTY

NAME: Chartiers Creek stream improvement (channelization) between Windgap road and Scully Yard Bridge. FUNCTION: Flood Control. EST. COST --

NAME: Investigation of recreation potential of developing <u>Islands</u> in Ohio, Allegheny Rivers - Brunot, Six-Mile, Twelve-Mile, Nine-Mile, Jacks, and Sycamore Islands. FUNCTION: Recreation. EST. COST --

NAME: Deer Creek Park and Reservoir (Confluence of Deer Creek and Allegheny River at Harmarville, near Oakmont). FUNCTION: Recreation. EST. COST --

NAME: Port Studies (Allegheny Co. Port Authority). FUNCTION: Port Improvements. EST. COST: \$115.800.

INDIANA COUNTY

NAME: Dam on South Branch of Plum Creek (W. Central Indiana County). FUNCTION: Recreation, Flood Control, Water Supply. EST. COST --

NAME: Blacklick Creek Watershed (E. Central Indiana and W. Central Cambria). Indiana is in the watershed. FUNCTION: Flood Control, Recreation. EST. COST: \$5.085.700.

NAME: Increased use of Mahoning Dam (in N.W. Indiana and E. Central Armstrong). FUNCTION: Recreation. EST. COST --

NAME: Additional recreation facilities at Conemaugh Reservoir. FUNCTION: Recreation. EST. COST --

NAME: Investigation to determine acid-mine drainage source and to upgrade water quality on Conemaugh Reservoir. FUNCTION: Water Quality. EST. COST --

FAYETTE COUNTY

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NAME: Indian Creek Watershed - 3 structures (E. Fayette Co. and S.E. West-moreland Co.) S.C.S. FUNCTION: Flood Control, Water Supply, Recreation. EST. COST: \$4,600,600.

NAME: Jacob's Creek Project. FUNCTION: Recreation, Flood Control. EST. COST --

V-88-Pa

NAME: Big Sandy Creek Reservoir - S. Fayette Co. (N. Wharton Twp.). Extends into West Virginia. (U.S. Corps) FUNCTION: Flood Control, Water Quality, Water Supply, Recreation. EST. COST: \$25 million, inc. Rec. facilities.

GREENE COUNTY

NAME: Dunkard Creek Reservoir - Tributary to Monongahela River (S.E. Greene Co.) (U.S. Corps). FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

BUTLER COUNTY

NAME: Impoundment on Buffalo Creek (S.E. Butler Co.) FUNCTION: Recreation. EST. COST --

NAME: S. Branch Bear Creek Flood Protection Study (in vicinity of Petrolia). FUNCTION: Flood Control. EST. COST --

NAME: Shank Run flood protection study (City of Butler). FUNCTION: Flood Control. EST. COST --

NAME: Connoquenessing Creek Watershed (S.W. Butler Co.) incl. towns of Butler and Zelienople. S.C.S. FUNCTION: Flood Control, Water Supply, Recreation. EST. COST: \$14,637,300.

NAME: Little Connoquenessing Creek Dam Site (W. of Butler) U.S. Corps. FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

NAME: Glade Run Reservoir - S.W. Butler County (U.S. Corps). FUNCTION: Flood Control, Water Quality, Water Supply. EST. COST --

NAME: Impoundments for: Carnahan, Rattling Run, Roaring Run, Apollo, N. Apollo, Leechburg, Big Run. FUNCTION: Water Supply. EST. COST --

NAME: Impoundment of S. Branch of Pine Creek for: Atwood, Dayton, Elderton, Rural Valley. FUNCTION: Water Supply. EST. COST --

NAME: Impoundment of Patterson Creek for Worthington Boro & Mushroom Factory. FUNCTION: Water Supply. EST. COST --

NAME: Investigation of acid mine drainage & measures & to upgrade quality on Crooked Creek Reservoir & Mahoning Reservoir. FUNCTION: Water Quality, Recreation. EST. COST --

NAME: Channelization of Allegheny River - Brady's Bend to Pt. below Parker. FUNCTION: Flood Control. EST. COST --

U.S. CORPS OF ENGINEERS - REGION B

NAME: Allocation of Appalachia Funds to S.C.S. to study streambank stabilization problems and carry out necessary construction measures in N.E. portion of Corps Region B. FUNCTION: Conservation. EST. COST --

U.S. CORPS OF ENGINEERS - REGION F

NAME: Appalachian funds made available for studies of abandoned oil and gas well contamination. FUNCTION: Water Quality. EST. COST --

ACKNOWLEDGEMENTS

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Bureau of Industrial Development

Milburn L. Forth, Research Director

ACKNOWLEDGEMENTS

Agency	Name	Title
	Hanc	-1010
<u>State</u>		
Department of Agriculture	Leland H. Bull	Secretary
	Charles F. Hess	Director, State Soil and Water Conservation Commission
	Ralph W. Hunter	Program Specialist, State Soil and Water Conservation Commission
Department of Community		
Affairs	Daniel Rogers	Deputy Secretary
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Department of Forests		
and Waters	Maurice K. Goddard	Secretary
	Vernon M. Beard	Chief, Division of Flood Control, Bureau of Engineering
	W. Wayne DeMoss	Hydraulic Engineer, Water Resources Section, Division of Flood Con- trol, Bureau of Engi- neering
	William C. Forrey	Assistant Director, Bureau of State Parks
	Marshall S. Gouldin	g Section Chief, Water Resources Section, Division of Flood Control, Bureau of Engineering
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Agency	Name	<u>Title</u>
Department of Forests and Waters (cont'd)	Clifford H. McConnell	Chief Engineer, Bureau of Engineering
	John McSparran	Hydraulic Engineer, Water Resources Section, Division of Flood Con- trol, Bureau of Engi- neering
	Fred S. Oldham	Assistant to Chief Engi- neer, Bureau of Engineer- ing
	Alan J. Sommerville	Water Resources Coordinator, Bureau of Engineering
Department of Health	Richard M. Boardman	Chief, Water Quality Section, Division of Sanitary Engineering, Bureau of Environmental Health
	Grover H. Emrich	Ground Water Geologist, Division of Sanitary Engineering, Bureau of Environmental Health
	Wesley F. Gilbertson	Director, Bureau of Environmental Health
	Walter A. Lyon	Director, Division of Sanitary Engineering, Bureau of Environmental Health
	Kenneth Schoener	Assistant Section Chief, Water Quality Section, Division of Sanitary Engineering, Bureau of Environmental Health

Agency	Name	<u>Title</u>
Department of Highways	Eric von Hausswolff	Deputy Secretary for Planning and Program- ming
	John J. Bilski	Appalachian Highway Coordinator, Bureau of Design
	Lambert J. Jaroska	Assistant Director, Bureau of Advance Planning
	Joseph R, McMurtry	Director, Bureau of Advance Planning
Department of Internal Affairs	Arthur A. Socolow	Chief State Geologist, Topographic and Geo- logic Survey
Department of Mines and Mineral Industries	M. B. Gutshall (Mrs.)	Executive Deputy Secretary
	John J. Buscavage	Sanitary Engineer, Coal Research and Development
	David R. Maneval	Director of Coal Re- search and Development
	C. A. Peterson	Appalachian Program Director
Fish Commission	Robert J. Bielo	Executive Director
	Gordon L. Trembly	Assistant Executive Director
Came Commission	R. S. Lichtenberger	Deputy Executive Director
	Nicholas I. Vukovich	Supervisor, Coopera- tive Resources Plan- ning, Division of Land Management

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Agency	Name	<u>Title</u>
Port Agencies		
Port Commission, City of Erie	Ned V. Collender	Port Director
	Joseph G. Rosenthal	Administrator
Port Authority of Allegheny County	Loran L. Lewis	Chairman of the Board
	John W. Dameron	Executive Director
Federal		
Appalachian Regional Commission	Monroe Newman	Professor of Economics, Pennsylvania State University, and Special Consultant to the Appal achian Regional Commis- sion
U. S. Army Corps of Engineers	Col. John C.H. Lee, Jr. Joe Auberg	Director, Office of Appalachian Studies Regional Economist, Office of Appalachian Studies
	Ben E. Netzer	Chief, Appalachian Studies Section
	W. T. Whitman	Civil Engineer, Office of Appalachian Studies
U. S. Department of Agriculture	Francis W. Artley	Agricultural Economist U.S. Department of Agriculture, Soil Con- servation Service
	John D. Graham	Civil Engineer U.S. Department of Agriculture, Soil Con- servation Service
	V-96-Pa	

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Agency	Name	Title
U. S. Department of Agriculture (cont'd)	Peter B. Petras	Hydraulic Engineer U.S. Department of Agriculture, Soil Conservation Service
U. S. Department of Interior Bureau of Outdoor Recreation	Ronald M. Pyle, Jr.	In charge, Water Resources Section, Northeast Regional Office
Local Development Districts		
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Northern Tier Economic Development Association	Mrs. Teresa B. McDonald	Development Aid Coordinator
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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 10 SOUTH CAROLINA WATER SUPPLEMENT

Prepared by The South Carolina Water Resources Committee

1968

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

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SECTION I - PURPOSE OF SUPPLEMENT

Section 206 of the Appalachian Regional Development Act (Public Law 89-4) provides that the Secretary of the Army, in cooperation with the Appalachian Regional Commission, other Federal agencies, and the States concerned, shall prepare "a comprehensive plan for the development and efficient utilization of the water and related resources of the Appalachian region...(as) an integral and harmonious component of the regional economic development program authorized by this Act." The Secretary's responsibility with respect to Section 206 was assigned to the U.S. Army Corps of Engineers, which established the Office of Appalachian Studies for that purpose at Cincinnati, Ohio.

In order to carry out the coordination required by the Act, the Office of Appalachian Studies has worked with the other agencies and the States involved in collecting information regarding laws, policies, and programs as well as plans concerned with the development and utilization of water and related resources.

In addition, each state has been requested to submit its own Supplemental Plan to become a part of the Sub-regional Plan to be prepared by the appropriate District Office of the Corps of Engineers. The S. C. Water Resources Committee has been requested by the Governor to take the leadership in coordinating the preparation of the South Carolina Supplement.

The basic objective of the Plan is to provide the best use, or combination of uses, of water and related land resources to meet all foreseeable short and long-range needs. The plan is predicated on the concept that an adequate supply of good quality water, and related land resources, are essential to the economic development and growth of the area to its maximum potential.

SECTION II - SCOPE OF SUPPLEMENT

There are six counties in South Carolina included in the Appalachian Development Area. They are Cherokee, Spartanburg, Greenville, Pickens, Anderson, and Oconee. The six county area comprises a total of approximately 4,000 square miles. Two major River Basins serve the Area-The Santee Basin to the East and the Savannah Basin to the West. Both of these rivers are tributaries of the Atlantic Ocean. (Figure 1)

It is the intent of the South Carolina Supplement to inventory the water resources in the Area insofar as information and data are available. The status of existing water resource developments, as well as projects in the planning stage, or being contemplated, is the Bench Mark for planning the further development of water and related resources to meet the economic growth needs of the Area. The plan embraces recommended

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projects and measures for the development and enhancement of surface water sources for industrial and municipal development; water quality control; recreation and wildlife; and irrigation. Other facets of water resource development included in the plan are: Flood control and prevention, flood plain studies, and ground-water potentials.

The plan is formulated to meet the needs of the six South Carolina Counties in the Appalachia Area for water resources development to 1980, 2000, and 2020. The plan will reflect the urgent need for additional research and data; particularly in hydrology, topography, and economics in order to study the projected plans and programs in greater detail.

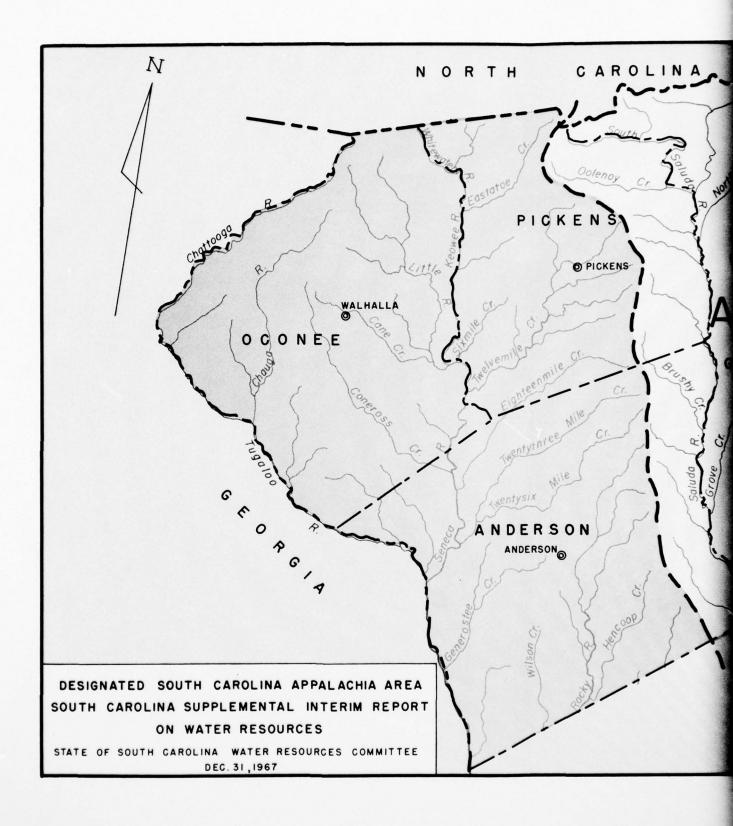
SECTION III - AGENCIES IN SOUTH CAROLINA WITH WATER RESOURCE RESPONSIBILITIES

In this section agencies that are operating in the State in the area of water resource management or control are listed and discussed. To facilitate this undertaking, all agencies have been classified into one of the four following categories: (1) special-purpose districts; (2) interstate commissions; (3) state boards, departments and agencies; and (4) Federal Agencies. They will be treated in the order in which they are listed.

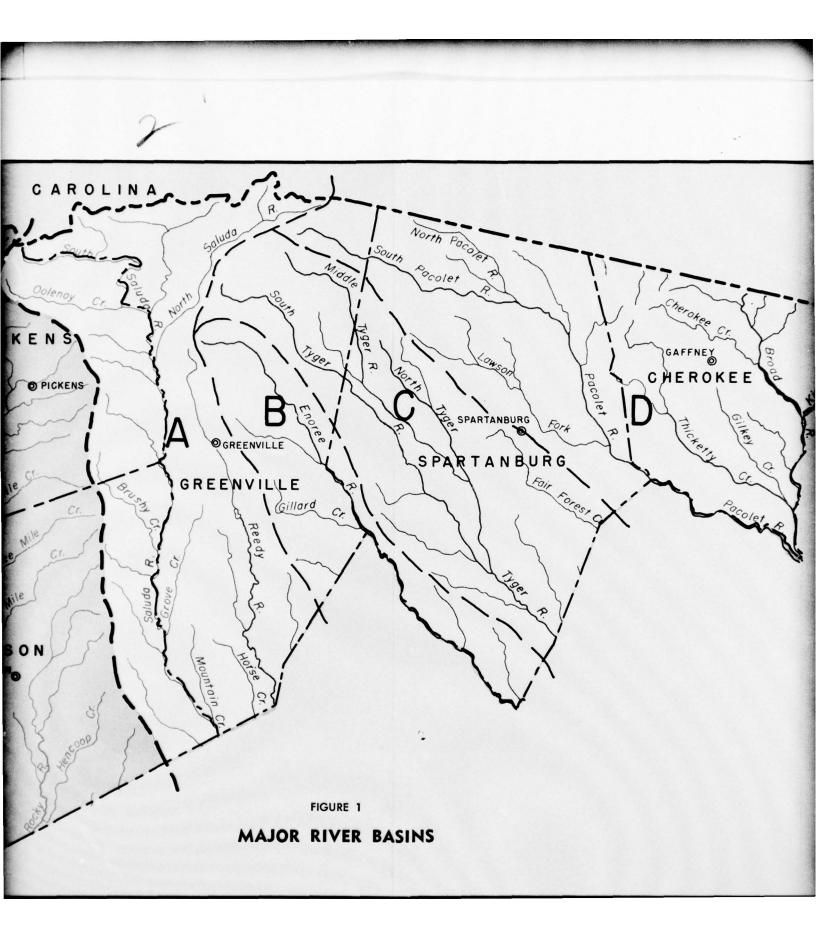
Paragraph I - State Agencies

Soil and Water Conservation Districts. In February 1937 the President of the United States wrote the Governors of all the States requesting that each State legislature pass an enabling Act permitting local land owners to join together into soil conservation districts. South Carolina responded to the President's request immediately, and on April 17, 1937, an Act known as the Soil Conservation Districts Law (1962 Code), Section 63-51 to 63-167) went into effect. This law was amended in February 1965, changing soil conservation districts into soil and water conservation districts (R115, H1187).

A soil and water conservation district is a legal unit of the state government. Each district is self-governed, being directed by a board of five supervisors. Three of these five supervisors are elected by the landowners in the district and the other two are appointed by the State Soil and Water Conservation Committee. Each district has a district-wide program and plan of action. Under State law, districts can accept materials and services from federal, state, and private sources, and they can acquire and manage property in the interest of conservation. Property acquired by the districts is exempt from taxation, and income that may result from the ownership and management of property must be used to further the cause of soil and water conservation in the district. Public and private funds may also be utilized by districts in the carrying out of their conservation programs. The State Soil and Water Conservation



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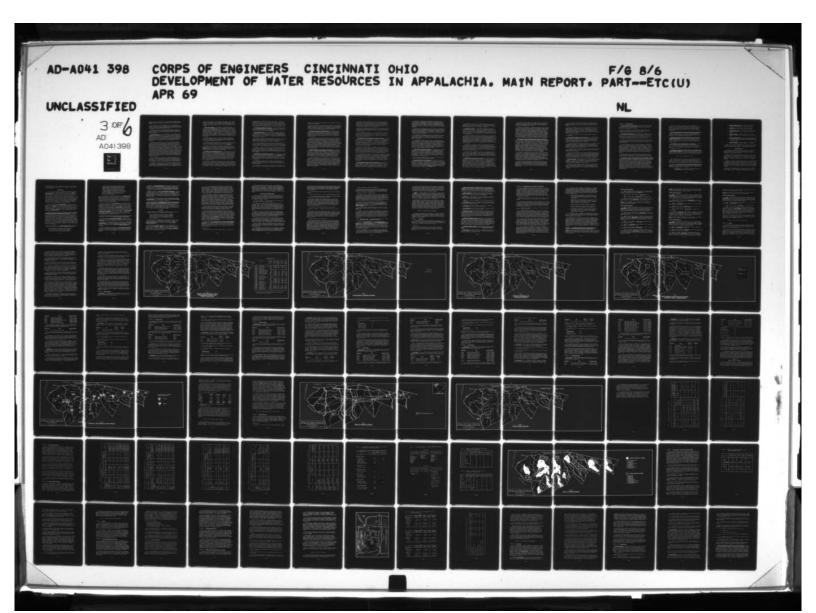
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Committee divides a portion of its state appropriations among qualified districts and maintains supervision over the use of State money granted to them.

The Provisions of the 1965 Amendment (R115, H1187) expanded the powers of the districts in the water-resource area to include the prevention of flood-water and sediment damages, and to further the conservation, development, utilization, and disposal of water.

At present there are 45 soil and water conservation districts that cover the entire State. All districts, except one which is made up of Jasper and Beaufort Counties are single-county districts and conform to county boundaries.

Watershed Districts. An Act that provided for the formulation and operation of watershed districts in the State was passed by the General Assembly on April 11, 1967, and signed into law by Governor McNair the following day. Prior to this Act, watershed projects in the State were almost entirely under the sponsorship of the local soil and water conservation districts. This Act provides for the establishment of special districts with the sole purpose of developing watersheds within the districts.

Watershed districts under this law (R233, S217) are established through the initiative of local people. Those landowners who desire to band together for watershed development purposes must first file an appropriate petition with the supervisors of the soil and water conservation district within which the watershed lies. Upon receipt of this petition, the supervisors are required to hold a public hearing. If there is sufficient interest and need, a referendum is held in which all persons that own land in the watershed are eligible to vote. If a majority of the landowners favor the establishment of the district, and the soil and water district supervisors determine that the operation of such a district is administratively practicable and feasible, and that the establishment of the district would be in the interest of the public health, safety, and welfare of the area, the district would become a governmental subdivision of the State, a public body corporate and politic, upon proper recordation by the Clerk of the Court and the State Soil and Water Conservation Committee.

Each watershed conservation district established under this Act is governed by a board of five directors chosen by the landowners within the district. If the supervisors of the soil and water conservation district approve, the board of directors may employ officers, agents, and other employees to carry on the work needed in the watershed district.

Watershed conservation districts have the power to acquire rights-of-way, easements, or land needed to carry out their programs through purchases, grants, or condemnation proceedings. They can also construct, repair, improve, operate, and maintain any works or improvements that are

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needed in the performance of their conservation program. Costs incurred by these districts are to be paid primarily from funds obtained through a special tax on real property. These districts may, under certain circumstances, borrow money or issue bonds or notes to supplement their tax revenues.

Public Works Districts. Act number 743 of the General Assembly of 1934 provided that communities that were not incorporated could establish public work districts (1962 Code, Title 59, Chapter 5). Under this law communities could establish water supply, electric lights, fire protection, and sewage disposal districts by petitioning the Clerk of Court. Upon receiving the petition, the Clerk of Court calls a referendum. If a majority of landowners within the proposed district vote in favor of the establishment of the district it becomes a body politic and may exercise the rights and privileges pertaining thereto. These districts are governed by three commissioners who are elected to six-year terms by the eligible voters in the district.

Districts organized under this law have the power of condemnation. They are also empowered to issue bonds and to obtain government loans. They are allowed to charge fees for the use of their services, and they can levy taxes on property in the district.

Incorporated towns can acquire their own waterworks under Article VIII, Section 5, of the State Constitution, or they can issue exclusive franchises for water purposes under Section 58-151 of the 1962 Code.

The State has also authorized several water authorities for areas larger than a town. For example, in Appalachia, The Oconee Water Authority. (1962 Code, Sections 70-451 to 70-463). These authorities have the assigned function of acquiring and distributing water for domestic and industrial purposes in their respective service areas.

Southeast Basins Inter-Agency Committee. Public Law 85-850, which was passed on August 28, 1958, established the United States Study Commission, Southeast River Basins. This Commission developed a comprehensive plan for the conservation, utilization, and development of the land and water resources of part of the Southeastern United States. The Commission was made up of eleven members; one from each of the four states in the area (Alabama, Florida, Georgia, and South Carolina), and the other seven from each of the principal federal land and water agencies (Army; Commerce; Health, Education and Welfare; Agriculture; Interior; Labor; and the Federal Power Commission).

The Commission projected the future needs of this area (the Savannah River Basin was the only portion of South Carolina included), and developed a plan that would provide for these increased needs. The Southeast Basins Inter-Agency Committee is in essence a carry-over of the Study Commission. It is composed of one member from each of the five member states (Mississippi has been added to the area) and a representative from each of the seven

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principal federal land and water agencies listed above. Its purpose is to coordinate the work being done in this area by different state and federal agencies, and to revise and expand the original plan to keep it up to date. A Resources Advisory Board with an office in Atlanta, Georgia, has as its purpose the implementation of the plan. As of August 4, 1967, South Carolina was not an active member of the Resources Advisory Board.

State Boards, Departments, and Agencies. South Carolina has several boards, departments, committees, and commissions that are concerned with the control and management of water resources in Appalachia. Each of these agencies has its own authorization and purposes.

State Development Board. The South Carolina State Development Board was established by the provisions of Act 122, the Research, Planning and Development Act of 1945, and amended by Act 256, 1959, (1962 Code, Sections 9-301 to 9-312) for the purpose of "conducting an adequate statewide planning program...for the stimulation of economic activity to develop the potentialities of the State."

The Board is governed by sixteen Directors, one from each of the State's fifteen judicial circuits and one from the state at large who is the Chairman. All appointments to the Board are by the Governor, with the advice and consent of the Senate, for a term of five years.

The Board is interested in water resources from an industrial point of view. Records are maintained by the Board on the major streams in the State with respect to both quantity and quality of flow. This information is essential to water-oriented industry and is maintained for that purpose.

The Board has a Geology Division, but the Division does not collect data on the State's water supply. Information on the State's water supply is collected for the Board by the United States Geological Survey. The Division of Geology maintains a matching-funds agreement with the United States Geological Survey so that it may have access to the data collected by that agency.

South Carolina State Commission of Forestry. The Commission of Forestry was created by an Act of the General Assembly in 1927, (1962 Code, Section 29-1 to 29-30). This requires the Commission to make an annual report to the General Assembly "upon the forest conditions in the State." The Commission was further required to promote the preservation of the forests of the State, and to advise the general public of the State with respect to reforestation.

The Commission is composed of five members who are appointed by the Governor for six-year terms of office. The Governor must appoint two practical lumbermen, one farmer, the President of Clemson University, and one member-at-large.

The Commission is financed primarily through State appropriations and revenue received from the management and operations of its property. The

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Commission is also authorized to cooperate with and receive aid from other State and Federal agencies.

The principal activity of the Commission in the area of water-resource management is through its reforestation responsibilities in small watershed projects authorized by Public Law 566. The Commission also cooperates in all the conservation programs of all soil and water conservation districts in the State through a written agreement with each district.

South Carolina Wildlife Resources Department. The South Carolina Wildlife Resources Commission is responsible for the propagation and conservation of the wildlife resources in South Carolina. This Commission is responsible for studying game and fish conditions in the State and taking the necessary steps to insure an abundance of fish and game for the purpose of providing ample opportunities for people to hunt and fish in South Carolina.

The Commission has the authority to enforce all laws and regulations pertaining to the protection and harvesting of game and fish. The Commission maintains various hunting preserves and fishing lakes throughout the state to afford sportsmen with the opportunity for outdoor recreation through hunting and fishing. For the purpose of increasing these hunting and fishing areas, the Commission has been authorized to acquire additional lands. Various research programs are administered to gain further knowledge valuable to the maintenance and increase of wildlife populations. This Commission may work with other governmental agencies—state, federal and local—in undertaking and financing various projects and often cooperates with individual landowners who permit the public use of their lands for recreational pursuits.

Clemson University Water Resources Research Institute. The Water Resources Research Institute was established by Clemson University effective May 1, 1964. The purpose of the Institute is to develop and coordinate water resources research efforts. The Institute is responsible for direction and control of South Carolina water resources research projects financed through the Office of Water Resources Research of the United States Department of Interior according to the Water Resources Research Act of 1964, in addition to projects supported from other sources.

A Directorate appointed from a cross section of various disciplines is responsible for administration and implementation of the program of the Institute. The Directorate is responsible to a Policy Board and administers the research program through existing colleges, schools, or departments at Clemson University or elsewhere at educational institutions throughout South Carolina. Three Councils in each of the areas of Hydrology, Water Quality, and Water Policy were established to advise the Directorate and assist in the evaluation of research proposals, conduct seminars, and cooperate with agencies and firms throughout the State and Region on programs of mutual interest.

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The Water Resources Research Institute not only accepts research proposals for review, but participates in many other water resources related activities. Campus-wide involvement includes the dissemination of scientific and practical information on water resources, the coordination of research proposals, the collection of research results, and the collection of academic data on water resources.

Institute representatives coordinate research with other universities throughout the State, participate on statewide committees, and represent the University on national organizations such as the Universities Council on Water Resources.

Active research administered by the Institute includes 14 projects within 10 different disciplines within two Universitites. These research projects fall into categories including the nature of the water, the water cycle, water quality management and protection, water resources planning, and engineering works.

South Carolina State Soil and Water Conservation Committee. The State Soil and Water Conservation Committee was established by the provisions of the South Carolina Soil Conservation Districts Law of 1937 (1962 Code, Sections 63-61 to 63-70). The Committee is composed of five supervisors of soil and water conservation districts, one from each of the five conservation areas created by Section 63-61.1. Members are appointed to the Committee by the Governor, upon the recommendation of the executive committee of the South Carolina Association of Soil Conservation District Supervisors, for four-year terms.

The duties of the Committee are as follows: (1) to assist and coordinate the activities of the scil and water conservation districts in the State; (2) to secure the cooperation of the United States and its agencies and other state and county agencies; (3) to disseminate information throughout the State concerning the conservation activities of districts; and (4) to receive gifts, appropriations, land and equipment and to manage them for the benefits of the soil and water conservation districts.

The Committee employs a staff which is headed by an Executive Secretary. Financing of Committee activities is primarily through State appropriations. The Committee has been active in water resources conservation and development programs through the districts which it supervises. The Committee has also played a major role in informing the people of the State as to their legal rights concerning water resources. In addition, the Committee has and is making studies of State watersheds and the State's soil and water needs.

State Department of Parks, Recreation, and Tourism. An Act which provided for a State Department of Parks, Recreation, and Tourism (R185, S170) was passed by the General Assembly in 1967 and signed into law by Governor McNair on March 20. The Department is governed by a Commission known as the State Parks, Recreation, and Tourism Commission. The Commission is composed of seven members with a member coming from each

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of the State's six congressional districts and one member-at-large who is the Chairman. Commissioners are appointed by the Governor with the advice and consent of the Senate. There are four ex officio members: The Director of the State Development Board, the Director of the South Carolina Department of Archives and History, the State Forester, and the Director of the Division of Game of the South Carolina Wildlife Resources Department.

The State Forestry Commission's Division of Parks, the State Development Board's Travel and Information Department, and the South Carolina Wildlife Resources Department's Division of Outdoor Recreation have transferred their duties and powers to this Department. All funds allocated to the various Departments for parks, tourism or recreation were reallocated to this new Department.

The Department has duties which include the promition of the State's tourist attractions, the development and expansion of the State Park System, the inventorying of the State's existing parks and outdoor recreational resources, and the estimating of the future needs of these types of resources.

The Department is composed of the Division of Travel and Tourism which is responsible for the promotion of the travel and tourist industry, and the Division of Parks and Recreation which is responsible for the promotion and development of the State Parks and their recreational facilities. The Department is authorized to charge a reasonable fee for the use of the recreational facilities that it maintains. Revenue collected from this source will supplement annual appropriations from the State. The present State Park System is composed of 28 State parks and historical sites that occupy 50,061 acres of land.

South Carolina State Highway Department. The State Highway Department was established by the General Assembly in 1917 (1962 Code, Title 33, Chapter 2), and was assigned the function of the "systematic planning, construction, maintenance, and operation of the State Highway System." It is governed by the State Highway Commission which is composed of sixteen members, one from each of the State's sixteen Judicial Circuits. Commissioners are elected by the legislators of the Judicial Circuit that they represent for four-year terms.

The State Highway Department becomes involved with water resources through its construction and maintenance programs.

South Carolina Public Service Commission. Article IX, Section 14 of the State Constitution of 1895 provided for a commission to be known as "The Railroad Commission." The Provisions of Act Number 18 of the General Assembly of 1935 changed the name of this commission to the South Carolina Public Service Commission (1962 Code, Title 58, Chapter 2). The Commission is composed of seven members, one from each of the seven Commission Districts as defined in Section 58-52, 1962 Code of Laws, who are elected by the General Assembly to serve four-year terms.

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The Commission's activity in the water resource area is through its jurisdiction over electric light and power companies, transportation companies, and sewage and water companies. It has the power to regulate and control the activities of these types of companies.

State Board of Health. The State Board of Health was created by the General Assembly on December 23, 1878, and was assigned the function of being "The sole advisor of the State in all questions involving the protection of the public health," (1962 Code, Sections 32-1 to 32-39). The Board is composed of the South Carolina Medical Association, an organization of the doctors of South Carolina, the State Comptroller General, and the Attorney General.

The Board is governed by an Executive Committee which is composed of seven members of the South Carolina Medical Association and one member from each of the State Nurses' Association, the State Dental Association, the State Veterinarians' Association, and the State Pharmaceutical Association. Membership on the Executive Committee is by gubernatorial appointment upon the recommendation of the Association that the member represents. The Governor also appoints the State Health Officer upon the recommendation of the Executive Committee, and the chief administrative officer of the State Board of Health.

The State Board of Health is composed of several divisions and sections; in addition, it operates a County Health Department in each of South Carolina's forty-six counties. The Division of Sanitary Engineering is the division of the Board that is primarily concerned with the State's health laws concerning water. Its duties include the supervision of public bathing places, and the certifying of water supplies and watering points used by interstate carriers.

The Board is also assigned the responsibility of setting standards for the water that boarding houses, hotels, inns, and restaurants must provide for their guests. Samples of water that water suppliers make available to their customers, guests, or employees are analyzed by bacteriologists in the Division of Laboratories to determine if the State standards are being met.

South Carolina Pollution Control Authority. The South Carolina Pollution Control Law was passed in 1950. The Pollution Control Authority provided for in the law was created within the State Health Department and consists of ten members. The members include: two representing the Executive Committee of the State Board of Health; one representing the Cotton Manufacturing Association; one representing the Pulp and Paper Industry; one representing the Wildlife Association; one representing the Municipal Association; one representing farmers; two representing labor; and, the State Health Officer serving Ex-Officio as Chairman. The technical staff of the Authority is under the direction of the Executive Director who is selected by the Pollution Control Authority.

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The Authority has the jurisdiction to abate, control and prevent the pollution of the waters of the State consistent with the protection of the health and physical property of the people, maximum employment and full industrial development of the State.

The Authority is empowered: to safeguard the waters of the State from pollution; hold public hearings; to make, revoke or modify orders requiring the discontinuance of the discharge of waste materials into any waters resulting in pollution in excess of applicable standards; to institute or cause to be instituted legal proceedings to compel compliance with orders of the Authority; to issue or deny permits; to conduct investigations; to cooperate with the Federal government in respect to Pollution Control matters; to conduct or cause to be conducted studies and research with respect to pollution abatement and control; and to approve projects for which applications are made for loans or grants under the Federal Water Pollution Control Act; to adopt standards of quality and purity and to classify all waters in accordance with considerations of best usage.

South Carolina Water Resources Planning and Coordinating Committee. An Act to establish a State Water Resources Planning and Coordinating Committee was passed by the General Assembly on February 28, 1967, and signed into law by Governor McNair on March 1, 1967. The Committee is composed of eighteen members, ten of whom are appointed by the Governor for three-year terms. Of the ten appointed by the Governor, three must represent the interest of agriculture, three must represent the interest of municipalities, three must represent the interest of industry and one must represent saltwater interests. The heads of the State Department of Agriculture, the South Carolina Pollution Control Authority, the South Carolina Wildlife Resources Department, the South Carolina State Forestry Commission, the State Soil and Water Conservation Committee, the State Development Board, the Clemson University Water Resources Research Institute, and the State Highway Department are members, ex officio.

The Committee is administered by an Executive Director and his staff. Its duties are: to formulate a comprehensive water resources policy for the State; to review the actions and policies of the State agencies with water resource responsibilities; to determine if actions of State agencies are consistent with the State's comprehensive water plan; to review projects, plans, or programs of federal aid affecting the control or use of water in the State and to make the appropriate recommendations; and, to recommend to the General Assembly any changes of law required to implement the declared policy of the State on water resources.

The South Carolina Water Resources Committee is also involved in the cooperative cost-sharing arrangements with the Federal Water Resources Council under the terms of Title III of P.L. 89-80, the Water Resources Planning Act of 1965. Under these provisions, 50% matching funds are available and are being used to perfect a state-wide comprehensive water resource plan.

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The South Carolina Water Resources Committee has already established negotiation procedures with the neighboring states of Georgia and North Carolina in order to effectively resolve problems related to interstate waters.

This study, included in this report of the water resources of the six Piedmont counties of the Appalachian Region Commission, is a typical example in which the committee has taken the responsibility and leadership for comprehensive planning. In so doing, the several agencies of the state and federal government having water related responsibilities have brought together their expertise for this intensive study which is a first step toward statewide planning.

This Committee replaces the South Carolina Inter-agency Council on Water Resources.

South Carolina Appalachian Advisory Commission. The South Carolina Appalachian Advisory Commission was created by Executive Order of Governor Robert E. McNair in October of 1965. This Commission's basic responsibility is to recommend plans, program priorities and projects to the Governor and to advise him generally on matters relating to the administration of the Appalachian Act in South Carolina.

The Advisory Commission membership, appointed by the Governor, includes representation from each of the member counties (Anderson, Cherokee, Greenville, Oconee, Pickens, and Spartanburg). This Commission directs the work of a technical staff supported by Appalachian and State funds. Commission offices are located in Greenville.

The Governor's Office discharges the State Government's responsibilities under the Appalachian Act including the coordination of all State Agency participation in the program.

One of the Advisory Commission's principal responsibilities involves the preparation of the State's Investment Plan for South Carolina Appalachia. Upon approval by the Governor and by the Appalachian Regional Commission, this Plan (which is revised and updated each fiscal year) guides the investment of Appalachian funds in a variety of categories, including education, health, transportation, and water pollution control facilities.

Other State Groups. South Carolina has a State Water Resources Advisory Committee. This Committee was established in 1966 by executive order of Governor R. E. McNair. It is composed of some 37 members who represent different interests throughout the State. The Committee advises the Governor on matters pertaining to water resources.

The Senate standing committees on Agriculture, Fish, Game, Forestry, and Natural Resources all have interests in the water resources of the State. The House of Representatives has a standing committee on Agriculture and Conservation, which is also interested in the State's water resources.

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Paragraph II - Federal Agencies

United States Army Corps of Engineers. The Charleston District Office of the Corps covers all of South Carolina except for that portion of the State that lies in the Savannah River Basin and that area is under the control of the Savannah District Office.

The Corps of Engineers in South Carolina has responsibilities in navigation, flood control, beach erosion control, water supply, water pollution control, hydroelectric power, and recreation.

The Soil Conservation Service was established as a permanent agency in the U.S. Department of Agriculture by the enactment of Public Law 46 on April 27, 1935. It is the U.S. Department of Agriculture's technical arm of action for soil and water conservation. It cooperates closely with Federal and State agencies that deal with loans, cost sharing, fish, wildlife, recreation and other matters related to land and water use.

Among the varied responsibilities and activities of SCS two major ones are helping individuals with their conservation systems for their own land, and assisting groups of individuals and organizations with programs for entire watersheds.

The Soil Conservation Service has general responsibility for administration of the Watershed Protection and Flood Prevention Act, PL-566, as amended. This includes responsibility for the installation of structural works of improvement and land treatment measures on non-Federal land in authorized watersheds. It also makes river basin and regional type surveys and investigations of the watersheds of rivers and other waterways in cooperation with other Federal, State and local agencies. The Service also participates in interagency coordination activities in connection with the water and related land resource programs of States and other Federal agencies.

The Soil Conservation Service administers the Federal part of the National Cooperative Soil Survey. It heads the USDA's National Inventory of Soil and Water Conservation Needs, including watershed project needs.

U.S. Geological Survey, Water Resources Division, Department of Interior. The Water Resources Division investigates the occurrence, quantity, quality, distribution, and movement of surface and underground waters that comprise the Nation's water resources. Its activities include the systematic collection, analysis, and interpretation of data relating to the evaluation of national water resources, and investigation of water demand for industrial, domestic, and agricultural purposes; research and development to improve the scientific basis of investigations and techniques; and reporting of the results of these investigations through publication or other forms of public release. Many of the Division's activities are conducted in cooperation with state, interstate, municipal, and local government agencies as a joint planning and financing effort to solve water resources problems.

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The Division provides scientific and technical assistance in appropriate fields to other Federal agencies. The Division's objectives mesh closely with many interests of these agencies and thus the Division's assistance contributes to the efficiency of the other agencies' programs and encourages the maintenance of high standards of technical accomplishment.

Farmers Home Administration, United States Department of Agriculture. The FHA is a lending agency. It makes loans for farm purchases and to individuals and associations to finance soil and water conservation programs. Loans are also made to rural water districts, and to associations that have small watershed development programs.

Agricultural Stabilization and Conservation Service, United States

Department of Agriculture. The ASCS has offices in all 46 of South

Carolina's counties. Through its agricultural conservation program it
offers a cost-sharing plan to farmers that pays approximately fifty percent of the cost of establishing approved soil, water, woodland, and
wildlife practices.

Forest Service, United States Department of Agriculture. The Forest Service administers the two National Forests in South Carolina, the Francis Marion and Sumter National Forests, which compose some 587,000 acres. The Forest Service manages these forests for the sustained yield of five basic forest resources and services—timber, water, forage, recreational, and wildlife.

Environmental Science Services Administration, Weather Bureau, United States Department of Commerce. The Weather Bureau, in addition to forecasting the weather, also maintains a river reporting and flood forecasting service for South Carolina. Forecasting offices are located in Columbia, Charleston, Greenville-Spartanburg Airport, and at Clemson University.

SECTION IV - SOUTH CAROLINA'S WATER LAW

South Carolina's water law is composed of laws arising from these sources: Constitutional law, statutory law, and court-made law. Court-made law or common law is the most important of these three sources. It should also be noted that international and national laws affect the State's legal position and powers concerning water and related land resources.

According to The Report of the President's Water Resources Policy Commission, state powers relating to the control of water resources have seven major limitations based upon the Constitution of the United States and court interpretations of it. These are:

(1) Commerce Power. This provides the federal government with the power to regulate interstate commerce.

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- (2) Federal Proprietary Power. This power gives the federal government absolute power over federally owned lands.
- (3) War Power. This power allows the federal government to pre-empt states in the interest of national defense.
- (4) General Welfare Power. This power gives the federal government broad power to act in the interest of the general welfare.
- (5) Interstate Compacts. Compacts made between states and ratified by the Congress take precedence over contrary state laws.
- (6) Rights of Riparian Owners. States may acquire riparian rights from private owners through eminent domain proceedings, but they can not acquire these rights when the federal government is a riparian owner.
- (7) Treaty Making Power. Agreements made by the federal government with foreign countries are superior to state laws.

Except for the limitations enumerated above, states are free to determine their own water laws and programs. The remainder of this chapter is a summary of South Carolina's position at this time (December 1967).

Constitutional Law

The State of South Carolina presently operates under a constitution that was originally adopted by the constitutional convention held in Columbia in 1895. Three specific references to water are contained in the main body of the Constitution of 1895.

Article 1, Section 28, provides that navigable waters of the State shall always be public highways free to the citizens of the State and the United States, with no tax impost or toll. No impost or wharfage can be demanded for the use of the shores or a wharf erected on the shores or in the water of a navigable stream unless it is authorized by the General Assembly.

Article VIII, Section 5 authorizes cities and towns to acquire ownership and management of plants that would furnish individuals and private corporations with water, lights, and ice. And Article XIV, Section 1, states that South Carolina has concurrent jurisdiction on all rivers bordering on the State, and that these streams are free highways for all South Carolina and United States citizens unless provided for differently by the General Assembly.

Article I of the Amendments to the Constitution is also related to water resources in that it requires the General Assembly to write a law which will provide for the condemnation of all lands necessary for the

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proper drainage of the State's swampy and low lands. It also requires that an equitable tax be assessed to pay the expenses of the condemnation and drainage.

Statutory Law

South Carolina's statutory law is completed and published every ten years, the most recent decennial publication being the 1962 <u>Code of South Carolina Laws</u>. The code contains all of the general statutory law that was in effect on January 9, 1962. In addition, an annual supplement is compiled by the Committee on Statutory Laws and the Code Commissioner, and attached to the Code. The 1962 Code contains 72 Titles, each dealing with a different subject and arranged alphabetically. Titles are always broken down into Sections, and some Titles contain Chapters and Articles as well as Sections. When a number is given to represent a certain statute such as 58-1 this implies that this particular statute is found under Title 58, Section 1. Generally, statutes are referred to numerically by Title and Section, with the first number designating the Title and the second representing the relevant Section.

Title 18 is concerned with dams and drainage. Section 5 of this title prohibits the building of any dam or bank to stop the course of any waters so as to overflow the lands of another unless consent of the other parties has been obtained. The letting off of reserved water that may injure crops on other's land is also prohibited. Section 18-6 makes it unlawful for persons to keep water on other's land, and Section 18-7 provides for the removal of milldams that have an adverse effect on the general health of the area.

Chapter 2 of Title 18 establishes the procedure through which rightsof-way for drainage may be obtained across another's land. This procedure is laid down in Article 1 (Section 18-51 to 18-58). In essence,
it provides that if a person, in order to drain his land, must cut a
ditch across a neighbor's property, he can do so even if the owner of the
adjacent property objects. He must give the objecting property owner a
ten-day written notice of his intentions. The written notice must designate someone to act as a referee for the person who intends to drain his
property. Upon receipt of this notice, the objector must name a referee
to represent his interest. The two appointed referees examine the premises
with respect to the proposed waterway or ditch and render a verdict as to
the route the ditch and the amount of compensation. The procedure is also
given that would apply if the adjacent property owners were not of legal
age or of legal competance.

Title 25 is concerned with the <u>power of eminent domain</u>. Section 24-52 has particular bearing on water resources activities. It declares:

State authorities, commissions, boards of governing bodies established by the State of South Carolina which may have been, or may be hereafter created, and authorized and empowered to develop waterways

of the State for use in intrastate, interstate and foreign commerce to construct, maintain and operate powerhouse dams, canals, locks, and reservoirs, to produce, transmit, sell and distribute electric power, to reclaim and drain swampy and flooded land to improve the health conditions of the State and to reforest watersheds, or for any such purposes the acquisition of property is necessary, shall have all rights of eminent domain of the State of South Carolina for such purposes....

Title 28 contains the statutes that pertain to the State's fish and game. The largest part of this Title contains laws that regulate hunting and fishing in the State. Section 28-754 is of general interest in that it provides that waters and bottoms are a common for taking fish. This Title, in addition to regulating hunting and fishing, contains the authorizations for the Atlantic State Marine Fisheries Commission and the State Wildlife Resource Department.

Title 32 includes the State's health laws, and the statutory authorization for the State Board of Health. Section 32-8 provides that any manufacturer must secure the approval of the State Health Office before disposing of plant waste into the waters of the State. Chapter 8, Article 1, contains the laws which pertain to water suppliers. Section 32-1201 provides that public water suppliers and other water suppliers that employ or deal with the public must send samples of their drinking water to the State Board of Health at least once every three months. The provisions of Section 32-1203 require the State Board of Health to inspect the watersheds and the water supply of public water suppliers. If any are found to be unsafe, a thirty-day notice is given. If after thirty days the supply remains unsafe, the State Board of Health has the power to close down the operation of the delinquent supplier.

Article VII, Section 32-1284 states that hotels, restaurants, boarding houses, and inns must provide a safe drinking water for their guests.

Title 58 is entitled "Public Service Companies." Section 28-12 requires all navigation, water works, power, and light companies to make an annual report to the State Tax Commission enumerating their gross receipts.

Section 58-151 provides municipalities with the power to grant exclusive franchises for the furnishing of water. Section 58-152 and 58-152.1 give water companies the power to condemn land for waterworks, and Chapter 10 of this fitle contains the provisions that regulate transportation companies.

Title 63 contains the laws that apply to soil and water conservation in the State. Soil and water con servation districts, the State Soil and Water Conservation Committee, and several other conservation agencies are authorized by this Title. These agencies will be discussed in the next Section.

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Title 70 is "Water and Watercourses" and contains the State's statutes relating thereto. Chapter 2 authorizes the Savannah River Navigation Commission, which is no longer in operation, and Chapters 3 and 4 authorize the creation and operation of the State Pollution Control Authority. This agency will receive attention in the next Section.

Chapter 1 of Title 70 contains laws relating to navigation. It defines a navigable stream as being "one that has been or can be rendered capable of being navigated by rafts or lumber or timber by the removal of accidental obstructions." This section further declares that navigable streams are common highways and forever free to all United States citizens and that anyone found guilty of obstructing the navigability of a stream will be punished by law.

Section 70-2 makes the deliberate or negligent obstruction of navigation a misdemeanor. Negligent transportation of logs or rafts that damage streamside property is also defined as a misdemeanor.

Section 70-3 requires all landowners to clean out all streams upon and adjacent to their lands at least twice a year. Landowners must keep them clear of obstructions so that a free and uninterrupted flow of sand and water may prohibit the building of dams, but it may be construed to require dam owners to maintain suitable and sufficient floodgates and waterways that would afford free passage through them of sand and water. Dam owners may also be required to open their floodgates if the State decides it is necessary. This would require court action.

Court Law

The South Carolina (Colonial) General Assembly adopted the Common Law of England in open session on December 12, 1712, by stating:

That all and every part of the common law of England where the same is not altered by the above enumerated acts, or inconsistent with the particulat constitution, customs and laws of this Providence...is in full force and virtue...

This declaration was incorporated into the Revised Statutes of 1872 Chapter 146, Section 10. Although it was deleted from the later editions of the State statutes, the State Supreme Court upheld it in <u>State V. Charleston Bridge Company</u> (101 S.E. 657) in 1919 by paraphrasing the original declaration.

The South Carolina Supreme Court adopted the riparian doctrine in 1837 in the case of Omelvany V. Jaggers (2 Hill 634) rejecting the doctrine of prior occupancy, which is similar to the present doctrine of prior appropriations. It was not, however, until 1901 in White V. Whitney Mfg. Co. (38 S.E. 456) that the burt laid down the broad principles of the riparian doctrine as relevant to the State.

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In 1907 the court developed the reasonable-use doctrine, and the State's legal position on surface waters today is still that of the riparian doctrine. A riparian right originates by reason of ownership of land contiguous to or abutting upon a natural watercourse or lake, or land through which such a natural watercourse passes to lower lying areas. A riparian right is a real property but is limited to the right to use the water rather than the ownership of the water itself. This is true because water is a moving rather than a stationary resource.

Each riparian owner is entitled to have the stream flow by or over his property undiminished in quantity and unimpaired in quality, provided that each riparian owner may make reasonable use of the water for his own particular needs, so long as he returns the flow to the water-course before it leaves his property. He is not charged with the evaporation or seepage losses nor the impairment in quality if his use is a reasonable one. Therefore, the stream may be depleted or impaired in quality by these riparian uses within reasonable limits. 1/ Reasonable use is a question of fact for a jury and its verdict is final. Therefore, reasonable use cannot be defined. It depends upon the relevant conditions and the jury's sense of judgment. What is considered reasonable use in one locality might not be considered reasonable in another.

Riparian rights are subject to rights by prescription. This implies that a person may obtain legal rights to the use of water even though he is not a riparian owner, by adversely acquiring and openly using another's water rights for an uninterrupted period of 20 years.

It must also be recognized that the riparian doctrine can be circumvented by expressed or implied permission or license. Since the State in effect owns the waters, such permission or license can be obtained by an act of the General Assembly. The State has made several such grants. For example, it has granted the Town of Walterboro permission to take up to eight percent of the flow of the Edisto River for domestic, industrial, and agricultural purposes (1962 Code, Section 70-471). Similar grants have been issued to the International Paper Company at Georgetown and to the Town of Newberry (1962 Code, Sections 70-481 and 70-491). The use of the water through permission is subject to the will of the permitter and cannot ripen into rights by prescription.

South Carolina has no authoritative body of water law established for ground water. The Attorney General, however, believes that the common-law rule that "the owner of the soil owns to the sky and to the center of the earth" governs ground water rights in the State. Under this rule ground water would be the property of the land owner, and hence he could use it as desired.

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^{1/}The Beneficial Use of Water in South Carolina. C.E. Busby, 1952.

Diffused surface waters (waters which are on the surface of the ground, but are in no way a part of a defined stream) have received attention from the State Courts. The Courts, in general, have regarded these waters as a common enemy, and have applied the common-enemy doctrine to questions involving them. Under this doctrine a landowner may take the appropriate steps to relieve or protect himself from these waters even though his actions may result in damages to adjacent property owners.

Tidal and Tidal Navigable Waters

In the case of a tidal navigable stream, the boundary line is the mean high water mark, in the absence of more specific language showing that it was intended to go below high water mark, and the portion of land between high and low water mark remains in the state in trust for the benefit of the public interest.

"Tideland" is defined as the "area between the high water mark and the low water mark of tidal navigable streams."

The State owns the land underlying its navigable waters in its sovereign capacity, that is, as a representative of, and in trust for, thepublic. Thus the state holds title to submerged lands in trust for, and subject to, the public purposes of rights of navigation, commerce, fishing, bathing, recreation or enjoyment, and other appropriate public and useful purposes, or such other rights as are incident to public waters at common law, free from obstruction and interference by private persons.

Ownership on the part of the state of land under navigable waters is subject to the paramount right of control of the federal government over commerce with foreign nations and among the states, including its power over navigation. The fact that the federal government occupies the bed of a stream for the purpose of constructing structures in aid of navigation does not divest the state of its title thereto.

The United States and the State of South Carolina have concurrent jurisdiction over the navigable waters of the United States (which are also navigable waters of the State). The State of South Carolina has exclusive jurisdiction over the remainder of the navigable waters of the State, i.e., those that are not also navigable waters of the United States.

Some of the federal agencies and departments exercising control over the navigable waters of the United States are: Federal Power Commission; United States Navy; United States Army, Corps of Engineers; and United States Coast Guard.

The state agencies exercising control over the tidelands, submerged lands and navigable waters of the state are: South Carolina Wildlife Resources Department, Division of Game, Division of Boating, and the Division of Commercial Fisheries; South Carolina Forestry Commission,

Division of State Parks; South Carolina Highway Department; South Carolina Ports Authority; South Carolina Public Service Authority (Santee-Cooper); South Carolina Public Service Commission; South Carolina Soil Conservation and Drainage Districts; and the South Carolina Water Pollution Control Authority.

The following constitutional statutory provisions are of significant interest.

Section 28-752 of the 1962 S. C. Code of Laws contains the following:

"(4) 'Bottom' includes all of the tidelands of the State covered by water when at the stage of ordinary high tide;"

Section 28-754 provides that the waters and bottoms of the bays, rivers, creeks and marshes not heretofore conveyed by a grant of the General Assembly or compact with the State shall continue and remain as a common for the people of the State for the taking of fish. Section 70-1 provides that all navigable water courses and streams which have been rendered or can be rendered capable of being navigated by rafts of lumber, etc. are common highways and forever free to the citizens of the State and United States.

The Constitution of the State contains the following items:

"Article 1, Section 28. Navigable waters free; no tax for use of wharf.

All navigable waters shall forever remain public highways free to the citizens of the State and the United States without tax, impost or toll imposed; and no tax, toll, impost, or wharfage shall be imposed, demanded or received from the owners of any merchandise or commodity for the use of the shores of any wharf erected on the shores or in or over the waters of any navigable stream unless the same be authorized by the General Assembly."

"Article 3, Section 331. Public Lands."

Lands belonging to or under the control of the State shall never be donated directly or indirectly, to private corporations or individuals, or to railroad companies. Nor shall such land be sold to corporations, or associations, for a less price than that for which it can be sold to individuals. This, however, shall not prevent the General Assembly from generating a right of way, not exceeding one hundred and fifty feet in width, as a mere easement to railroads across State land, nor to interfere with the discretion of the General Assembly in confirming the title to lands claimed to belong to the State, but used or possessed by other parties under an adverse claim." (Apparently this section was not in the 1868 Constitution.)

Article 4, Section 19. Grants and commissions.

"All grants and commissions shall be issued in the name and by the authority of the State of South Carolina, Sealed with the Great Seal, Signed by the Governor, and counter-signed by the Secretary of State."

Article 14, Section 1. Boundary Rivers.

"The State shall have concurrent jurisdiction on all rivers bordering on this State, so far as such rivers shall form a common boundary to this and any other State bounded by the same; and they, together with all navigable waters within the limits of the State, shall be common highways and forever free, as well to the inhabitants of this State as to the citizens of the United States, without any tax or impost therefor, unless the same be expressly provided for by the General Assembly."

Every body or stream of water navigable in fact is regarded as a public highway, and subject to free and unobstructed navigation by the public. 56 Am. Jur., Waters, Section 208, South Carolina S. B. Co. V. Wilmington, C. & A. R. Co., 46 S. C. 327.24 S.E. 337, 33 L. R. A. 541. State V. Thompson, 33 S. C. L. (2 Strob.) 12.

Public water highways, navigable waters, are governed by the same general rules of law as are public land highways. 56 Am. Jur., Waters, Section 225.

The rights of the public in navigable waters extend to all parts of such waters. Ordinarily, the right of actual navigation is co-existensive with the actual water line, expanding and contracting therewith as it fluctuates between the high and low water marks. When the volume of a stream swells in the time of high water, its surface remains the surface of the highway, and the riparian owner must do nothing that will interfere with the use of the highway or any part of it up to the line of high water.

See: State ex rel. Lyon V. Columbia Water Power Co., 82 S. C. 181, 63 S. E. 884, 22 L. R. A. (NS) 435, 70 A. L. R. 275.

The case of Rice Hope Plantation V. S. C. Public Ser. Auth., 216
S. C. 500, 59 S. E. (2d) 132 (1950), reaffirmed Cape Romain Land and Improvement Co. V. Ga.-Carolina Canning Co., 148 S. C. 428, 146 S. E. 434 (1928), and held that the land below mean high water mark is held in trust by the State for the public and is not held for purposes of sale. Even if certain tidelands were to be declared privately owned, they could not be filled or diked because the area is subject to the Federal and State navigational easement.

Sec. 1-793 provides that the S. C. Budget and Control Board cannot sell State trust property. Sec. 1-794 provides that the State cannot sell State land at less than its value. The tidelands are trust property and are held in a fiduciary and not a proprietary capacity.

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The office of the South Carolina Attorney General has consistently held, since the Cape Romain decision, that the lands lying between high water and low water belong to the people in common. No person owning land abutting the high water mark can be given any control or right to erect anything on the strip of land between the high water mark and the low water mark except by grant of the General Assembly.

Summary. "Our water problem is still unsolved, but we must face up to the fact in the near future, of how the stream or lake water shall be apportioned among the various riparians when the demand, as it surely will, for diversion of water for irrigation, industry, and municipal use becomes so heavy that the rights of other riparians or the public rights in water are endangered. Our present law governing water use and management gives no definite, clean-cut answer to this question.

The weaknesses of our present law, as I see them, are: it lacks reasonable legal protection for those who have invested their capital in irrigation systems, industry, and other projects requiring use of quantities of water; it fails to recognize any system of priority of use, conservation and prevention of waste; it lacks effective administrative guidance to assure that development and use may follow a course which protects existing rights and also assures full utilization of water resources in accordance with their inherent capabilities. Our system is not geared to the complex agricultural-industrial-urban economy of today, where large quantities of good water are required daily."2/

SECTION V - STATE WATER QUALITY STANDARDS

The State Water Pollution Control Authority is presently negotiating with the Federal Water Pollution Control Authority for revised water quality standards in South Carolina. Pending the conclusion of this negotiation, the water quality standards outlined below are the applicable standards for South Carolina.

Paragraph I - Definitions

The definition of any word or phrase employed in Paragraphs II and III shall be the same as given in Section 70-101, South Carolina Pollution Control Law. The following words or phrases which are not defined in said Section shall be defined or have meanings as follows:

^{2/}Quoted from paper presented at the First Annual South Carolina Governor's Conference on Water Resources, by General L.G. Merritt, Director, South Carolina Legislative Council, Columbia, S.C., March 1 and 2, 1967.

Source of Water Supply for Drinking, Culinary or Food Processing
Purposes shall mean any source, either public or private, the waters from
which are used for domestic consumption, or used in connection with the
processing of milk, beverages, food or for other purposes which require
finished water meeting U.S. Public Health Service Drinking Water Standards.

Approved Treatment as applying to water supplies means treatment accepted as satisfactory by the authorities responsible for exercising supervision over the sanitary quality of water supplies.

Bathing shall include swimming but shall be regarded as a best usage only for waters in which bathing is or may be expected to be subject to effective sanitary supervision and control.

Fishing shall include the propagation of fish and other acquatic life.

Agricultural shall include use of water for stock watering, irrigation, and other farm purposes, but not as source of water supply for drinking, culinary or food processing purposes.

<u>Tidal Waters</u> shall mean all waters whose elevation is subjected to periodic changes under the influence of oceanic tides.

Tidal Salt Waters shall mean those tidal waters which have a chloride content in excess of 250 ppm. (parts per million).

Underground Disposal shall mean the disposal of wastes by pumping or allowing to flow by gravity into the ground in such a manner as to enter the water-bearing strata of the earth. Such disposal is not to be permitted without the most careful justification. This definition does not cover the use of tile fields in connection with septic tanks, or any other type of ground-waste disposal permitted under regulations of the State Board of Health.

Intermittent Discharge of Wastes shall refer to the practice of holding industrial wastes, domestic sewage, or mixtures of the two; in lagoons, tanks or other suitable containers for discharge at appropriate times. Such lagoons, tanks, or other containers shall be considered waste treatment plants to be operated on permit of the Authority as specified by the Pollution Control Law and shall be considered waste treatment plants to be operated on permit of the Authority as specified by the Pollution Control Law and shall be operated in the manner specified by the permit.

Controlled Discharge of Wastes and other phrases or words of the same general intent shall be construed the same as <u>Intermittent Discharge of Wastes</u>.

Swamp Waters shall refer to waters whose topographical location is such as to cause them to have very low flow velocities, and certain characteristics different from adjacent streams.

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Paragraph II - Rules Applicable to All Classes and Standards.

The General Assembly of South Carolina, in Section 70-102, Code of Laws of South Carolina, has declared the following policy: "It is hereby declared to be the public policy of the State that reasonable standards of purity of the waters of the State be maintained, consistent with public health, the public enjoyment of such waters, the propagation and protection of fish, shellfish and wildlife, the operation of existing industries and the future industrial development of the State with a reasonable balance of consideration of the public welfare and, to that end, that the use of reasonable methods to prevent and control pollution of the waters be required."

Consistent with this policy, the Pollution Control Authority of South Carolina does adopt general rules for the waters of South Carolina as follows:

- 1. The classes and standards set forth in Paragraph III are intended to protect public health and welfare by providing criteria for the streams of South Caroline which will stabilize and improve water quality in step with changes in the economy of the State and new technical developments. No permit issued hereunder, therefore, shall be interpreted as creating any vested right in any person.
- 2. No waters of this State shall be used for the sole or principal purpose of transporting wastes.
- 3. No wastes amenable to treatment or control shall be discharged into any interstate water without treatment or control. All wastes, prior to discharge into any interstate water shall receive the best practical treatment or control unless it can be demonstrated that a lesser degree of treatment or control will provide for water quality improvement consistent with present and anticipated future water uses. This rule shall not be construed as requiring a greater degree of treatment than necessary to meet the Stream Classification Standards set forth in Paragraph III.
- 4. In any case where the waters into which sewage, industrial wastes or other waste effluents discharge are assigned a different classification than the waters into which such receiving waters flow, the standards applicable to the waters which receive such sewage or waste effluents shall be supplemented by the following stipulation: The quality of any waters receiving sewage, industrial wastes or other waste discharges shall be such that no impairment of the best usage of waters in any other class shall occur by reason of such sewage, industrial wastes discharges.
- 5. Tests or analytical determinations to determine compliance or non-compliance with standards shall be made in accordance with methods and procedures approved by the Pollution Control Authority. (In approving methods, so far as practical and applicable, the Authority will be guided by the latest edition of "Standard Methods for the Examination of Water, Sewage and Industrial Wastes" published by the American Public Health Association, the American Water Works Association, and the Water Pollution Control Federation.)

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- 6. In making any tests or analytical determinations of classified waters to determine affect on compliance or non-compliance of sewage, industrial wastes or other wastes discharged into them, samples shall be collected in such a manner and at such locations as are approved by the Pollution Control Authority as being representative of the receiving waters after opportunity for reasonable dilution and mixture with the waters discharged thereto.
 - a. Specific numerical standards for all classes shall be met for at least 16 hours of the 24 hour day. In no instance shall the maximum adverse deviation exceed 25% of the set specification.
 - b. Samples shall be taken from points so distributed over the area and depth of the waters being studied as to permit a realistic appraisal of such actual or potential damage to water use or aquatic life as may exist.
 - c. Bioassay methods may be used in appropriate situations.
 - d. Temporal distribution of samples in tidal waters shall be such as to cover the full range of tidal conditions.
 - e. The criteria are applicable to any fresh water stream when the flow rate is equal to or greater than the minimum 7-day-average flow rate that occurs with an average frequency of once in ten years.
- 7. Natural waters may, on occasion, have characteristics outside of the limits established by the standards. The standards adopted herein related to the condition of waters as affected by the discharge of sewage, industrial wastes, or other wastes.
- 8. Where tests for compliance with the fresh water standards for those classifications of B or above disclose that the minimum requirements thereof are being met with regularity at each point of use for swimming, domestic supply or other use specified for its class, as determined by paragraph 6. above, no violation of such classification shall be deemed to exist by virtue of any variation from the requirements thereof which occurs other than at any such point of use, due to the discharge of wastes into any stream so classified, unless the quality of the water at such other point fails to meet the normal requirements of the next lower classification.

Paragraph III - Established Classes for Fresh Surface Waters and the Standards of Quality and Purity Which Shall be Applied Thereto:

Class AA - Waters meeting South Carolina State Board of Health requirements as suitable for use for domestic and food processing purposes with sterilization as only treatment required. Suitable also for uses requiring waters of lesser quality.

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Class AA - Quality Standards

- l. <u>Item</u>: Floating solids; settleable solids; oil; sludge deposits; tastes or odor producing substances. <u>Specification</u>: None attributable to sewage, industrial wastes or other wastes.
 - 2. Item: Sewage or waste effluents. Specification: None.
 - 3. Item: Dissolved oxygen. Specification: Not less than 5 ppm.
- 4. <u>Item</u>: Toxic wastes, deleterious substances, colored or other wastes or heated liquids. <u>Specification</u>: None in amounts to exceed limitations set by S. C. State Board of Health for waters for this use.

<u>Class A</u> - Waters meeting S. C. State Board of Health requirements as suitable for use as swimming waters. Suitable also for other uses requiring waters of lesser quality.

Class A - Quality Standards

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- 1. Item: Floating solids; settleable solids; oil; sludge deposits. Specification: None which are readily visible and attributable to sewage, industrial wastes or other wastes and which measurably increase the amounts of these constituents in receiving waters after opportunity for reasonable dilution and mixture with the wastes discharged thereto.
- 2. Item: Sewage or waste effluents. Specification: None in such quantity or quality as to raise the Coliform bacteria mpn of these waters above 1,000 per 100 ml.
- 3. Item: Odor producing substances contained in sewage, industrial wastes or other wastes. Specification: The waters after opportunity for reasonable dilution and mixture with the wastes discharged thereto shall not have an increased threshold odor number greater than 8, due to such added wastes.
- 4. Item: Phenolic compounds. Specification: Not greater than 5 parts per billion. (Phenol)
- 5. Item: pH. Specification: Range between 6.0 and 8.0, except that swamp waters may range from 5.0 to 8.0.
- 6. Item: Dissolved Oxygen. Specification: Not less than 5 ppm, except that swamp waters may have a low of 2.5 ppm.
- 7. Item: Toxic wastes, deleterious substances, colored or other wastes, or heated liquids. Specification: None alone or in combination with other substances or wastes in sufficient amounts or at such temperatures as to be injurious to fish life or make the waters unsafe or unsuitable for bathing.

Class B - Waters suitable for domestic supply after complete treatment in accordance with requirements of the S. C. State Board of Health. Suitable also for uses requiring water of lesser quality.

Class B - Quality Standards

- 1. Item: Floating solids; settleable solids; oil; sludge deposits.

 Specification: None which are readily visible and attributable to sewage, industrial wastes or other wastes and which measurably increase the amounts of these constituents in receiving waters after opportunity for reasonable dilution and mixture with the wastes discharged thereto.
- 2. <u>Item</u>: Sewage or waste effluents. <u>Specification</u>: None in such quantities or qualities as to make the Coliform bacteria mpn of the waters exceed the mpn of 20,000/100 ml.
- 3. Item: pH. Specification: Range between 6.0 and 8.0, except that swamp waters may range from 5.0 to 8.0.
- 4. Item: Dissolved Oxygen. Specification: Not less than 4.0 ppm, except that swamp waters may have a low of 2.5 ppm.
- 5. Item: Phenolic compounds. Specification: Not greater than 5 parts per billion.
- 6. Item: Toxic wastes, deleterious substances, colored or other wastes, or heated liquids. Specification: None alone or in combination with other substances or wastes in sufficient amounts or at such temperatures as to be injurious to fish or make the waters unamenable to standard treatment processes intended to prepare them for domestic use.
- <u>Class C</u> Waters suitable for propagation of fish, industrial and agricultural uses and other uses requiring water of lesser quality.

Class C - Quality Standards

- l. <u>Item</u>: Floating solids, settleable solids; oil; sludge deposits. <u>Specification</u>: None which are readily visible and attributable to sewage, industrial wastes or other wastes and which measurably increase the amounts of these constituents in receiving waters after opportunity for reasonable dilution and mixture with the wastes discharged thereto.
- 2. Item: pH. Specification Range between 6.0 and 8.5 except that swamp waters may range between 5.0 and 8.5.
- 3. Item: Dissolved Oxygen. Specification: Not less than 4 ppm, except that swamp water may have a low of 2.0 ppm.
- 4. Item: Toxic wastes, deleterious substances, colored or other wastes, or heated liquids. Specification: None alone or in connection with other substances or wastes in sufficient amounts or at such temperatures as to be injurious to fish life or impair the waters for any other

best usage as determined by the Pollution Control Authority for the specific waters which are assigned to this class.

Class Ca - Waters suitable for fish survival*, industrial and agricultural uses and other uses requiring water of lesser quality.

Class Ca - Quality Standards

- 1. Item; Floating solids; settleable solids; oil; sludge deposits.

 Specification: None which are readily visible and attributable to sewage, industrial wastes or other wastes and which measurably increase the amounts of these constituents in receiving waters after opportunity for reasonable dilution and mixture with wastes discharged thereto.
- 2. Item: pH. Specification: Range between 6.0 and 8.5, except that swamp waters may range between 5.0 and 8.5.
 - 3. Item: Dissolved oxygen. Specification: Not less than 2.0 ppm.
- 4. Item: Toxic wastes, deleterious substances, colored or other wastes, or heated liquids. Specification: None alone or in combination with other substances or wastes in sufficient amounts or at such temperatures as to be injurious to fish survival or impair the water for any other best usage as determined by the Pollution Control Authority for the specific waters which are assigned to this class. *"Fish survival," as used in this standard, means the continued existence of individual fish normally indigenous to waters of this type.

Filed with the Secretary of State November 28, 1950; Amendment filed with the Secretary of State August 26, 1953; Filed with the Secretary of State March 20, 1967. This supersedes standards filed November 28, 1950, and amendment thereto filed August 25, 1953 (C_a).

SECTION VI - WATER RESOURCES IDENTIFICATION

Paragraph I - General

The crystalline rocks underlying South Carolina Appalachia represent five distinct geologic belts; and, from northwest to southeast, these belts are the Blud Ridge belt, Brevard belt, Inner Piedmont belt, Kings Mountain belt, and the Charlotte belt.

The Blue Ridge and Brevard belts are located in northwestern Oconee and Pickens Counties. The rocks of the Blue Ridge belt are generally interpreted to be Precambrian metasedimentary rocks into which igneous rocks of Paleozoic age were emplaced. The rocks of the Brevard belt are typically phyllonite and blastomylonite and are generally considered to represent a fault zone which separates the Blue Ridge belt from the Inner Piedmont belt.

The Inner Piedmont belt underlies all of Greenville and Anderson Counties and the major part of the remaining four counties in Appalachia. These rocks consist of an immense series of polymetamorphosed mica schists, granitic and mafic gneisses, along with numerous conformable intrusives of granite and quartz monzonite and associated pegmatites. The age of these rocks ranges from Precambrian to Paleozoic.

The Kings Mountain belt, present in eastern Cherokee and southwestern Spartanburg Counties, consists of low rank metamorphic schists and phyllites which contain distinctive beds of quartzite, comglomerate, marble and pyroclastic volcanics.

Rocks of the Charlotte belt, characteristically a granitoid gneiss, underlies the south-central portions of Cherokee County. These rocks are generally considered to range in age from Upper Precambrian to Cambrian.

The South Carolina Appalachian area is divided into two major physiographic provinces, the Blue Ridge, situated along the western boundary, and the Piedmont, comprising the eastern and larger area. The Blue Ridge adjoins the Ridge and Valley province to the northwest and the Piedmont to the southeast. This latter boundary is characterized by a marked change in topography referred to as the Blue Ridge Escarpment.

The Blue Ridge province is highly mountainous, containing high peaks and steep-sided valleys in contrast to the low-rolling hills of the more naturally dissected Piedmont. The rocks of both provinces range in age from Precambrian to Paleozoic.

Streamflow in the six-county area is generally abundant, and these geologic conditions contribute to good sustained yields even during period of low flow. Average yields range from about 0.90 to 2.40 mgd per sq. mi. (million gallons per day per square mile). During the severe drought of 1954, the flow of streams ranged from 0.03 to 0.32 mgd per sq. mi.

Before streamflow characteristic can be defined, data must be obtained on the variation of flow in terms of time and areal distribution. Collection of streamflow data is made throughout the area by the U.S. Geological Survey. Due to the wide range in the intensity of data collecting operations in each of the counties in Appalachia, it is necessary to report and evaluate the extent and adequacy of this phase of the water resource study on a county basis. Data collection at present sites in Spartanburg and Pickens Counties is generally adequate. Recommendations for additional data collection and studies of streamflow in the area are made in the discussion of the water resources of each county. Figure 2 shows the location and distribution of U.S. Geological Survey stream-gaging stations and includes a summary of flow data obtained.

Surface water of good quality is generally sufficient in this area though planning and management are becoming important as industrial growth continues. However, the addition of increasing amounts of industrial wastes must continue to be monitored.

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Figure 3 shows the location of water quality sampling stations operated by the United States Geological Survey and the fouth Carolina Pollution Control Authroity.

Figure 4 indicates the approximate locations of municipal and industrial effluents and Figure 5 shows the quality classification of streams as reported by the South Carolina Pollution Control Authority.

Laboratory data in the Office of the Pollution Control Authority include analyses on Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), pH, coliform (MPN), temperature, alkalinity (Phenolphthalein and total), color and turbidity. The number of analyses varies from two or three at some locations to 100 or more at others. In most cases a series of grab samples from 3 to 5 consecutive days were collected. A large percent of the stations have been sampled during the past two years. Critical areas have been sampled more often and an abundance of data exists for many of these.

The Pollution Control Authority has one field laboratory located in the Appalachian region (Greenville), and it is a physical impossibility to conduct the best possible stream monitoring program because of a lack of personnel. This laboratory is staffed with one chemist and one water sample taker. There is no permanently located automated stream monitoring equipment in the area. Rapid industrial growth and an ever increasing population dictates the absolute necessity for such equipment within the next few years.

Ground water occurs in the western part of the area principally in fractures formed by fault and joint systems. Water moves through similar fractures in the eastern part, but here a greater thickness of the weathered rock or residuum provides an additional medium for ground-water collection and movement.

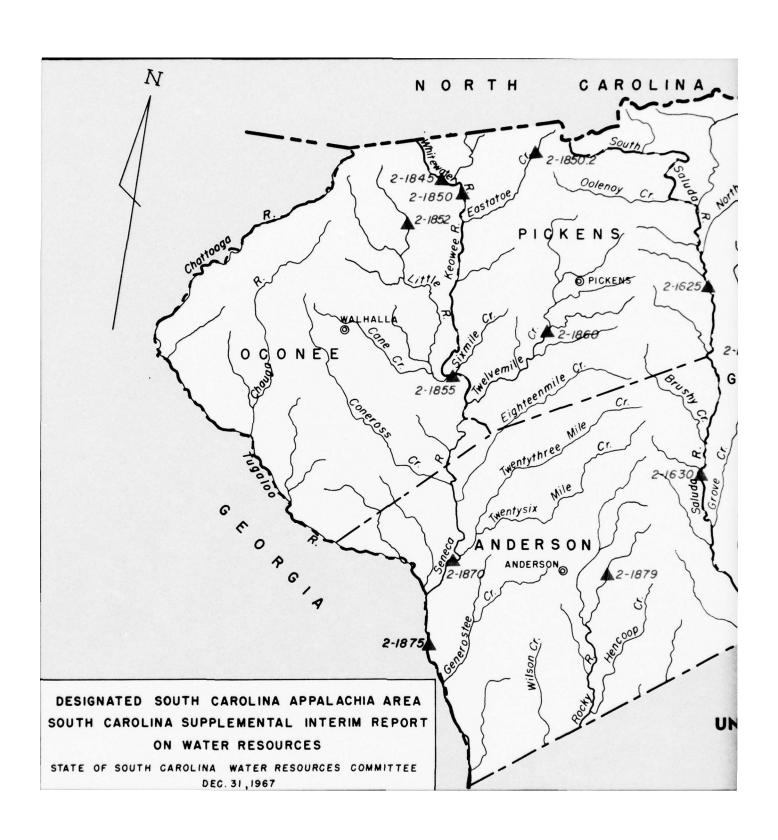
Well yeilds range from 2 to 300 gpm (gallons per minute) over the entire area although an average yield would more closely approximate 75 gpm. The water ranges from a soft, mildly acidic or neutral water of low dissolved-solids content in the light-colored granitic and schistose rocks, to a hard or very hard alkaline water in the dark-colored calcium, magnesium, and iron-rich rocks such as hornblende gneiss or diorite.

Adequacy of data on ground water ranges from inadequate to adequate throughout the six-county area, as indicated in the detailed county discussions that follow.

Paragraph II - Anderson County

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<u>Surface Water</u>. Stream-gaging stations operated by the U.S. Geological Survey on streams within the County or near enough to the County to be significant in water resource planning are:



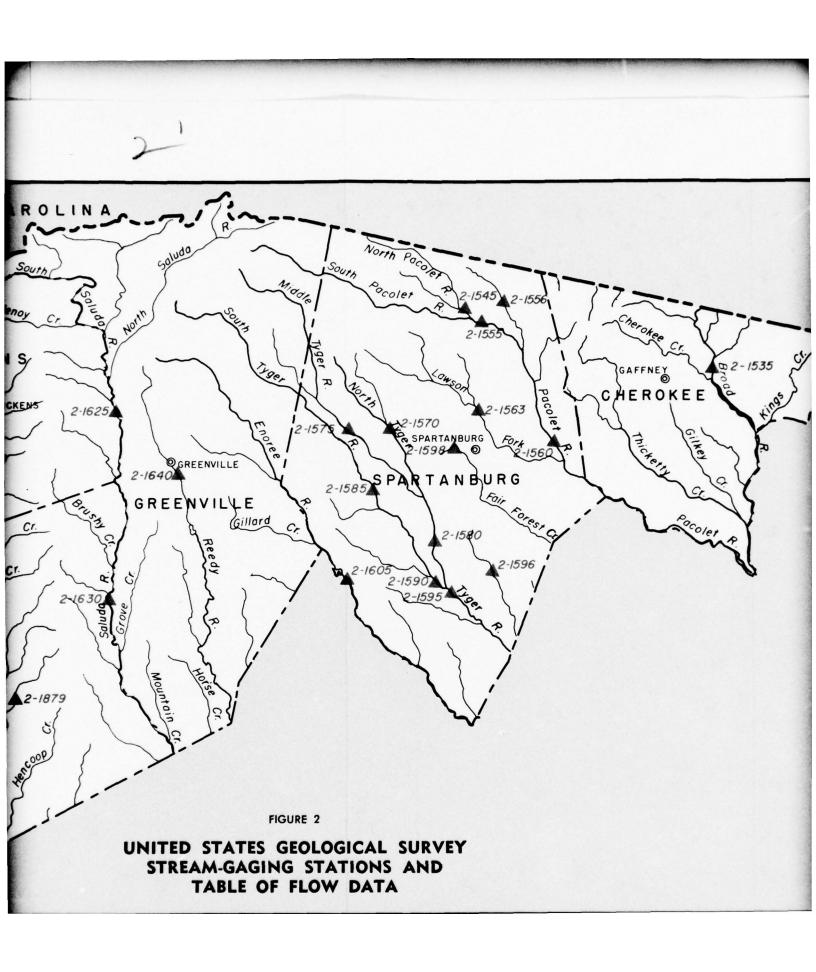


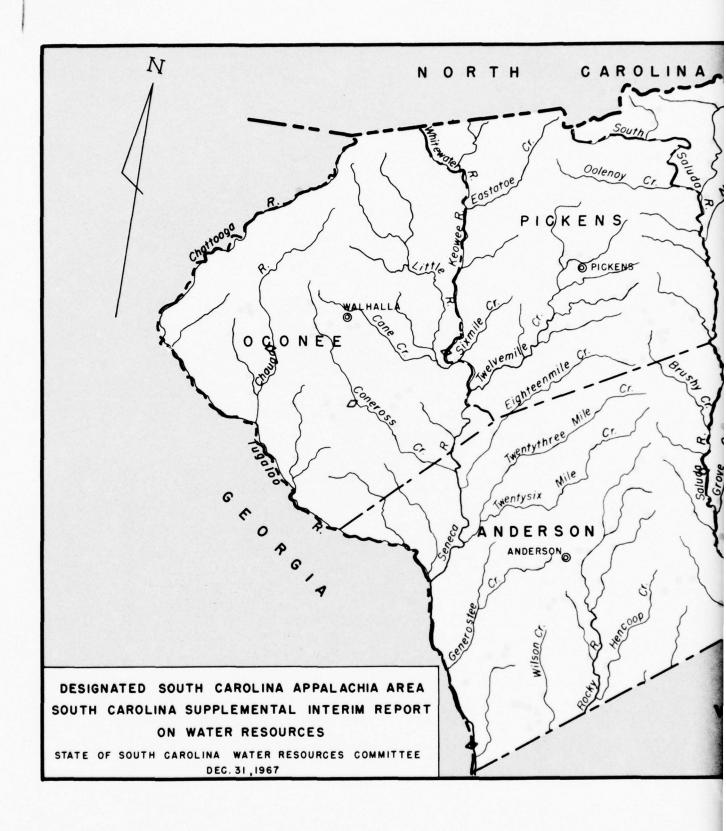
TABLE OF FLOW DATA

		Location	Drainage	Max.	Min.	Ave.	Ave
			Area	Flow	Daily	Flow	Yield
cr \ \			Sq Mi	MGD	Flow	MGD	MGD,
					MGD		Sq M
D 2-1535							
× = = 3	2-1535.	Broad River	1,490	76,910	145	1,596	1.07
KEE C	2-1545.	North Pacolet River	116	8,079	18.1	134	1.15
1	2-1555.	Pacolet River	212	14,736	20.7	221	1.04
101	2-1556.	Buck Creek*	10.5	_	_	-	_
Silvery &	2-1560.	Pacolet River	320	17,321	11.0	320	1.00
(2)	2-1563.	Lawsons Fork Creek*	65.2	_		-	
	2-1570.	North Tyger River	44	2,333	4.5	41.6	.95
1064	2-1575.	Middle Tyger River	68.3	3,102	3.2	66.6	.98
Can 1 6	2-1580.	North Tyger River	162	7,949	10.3	151	.93
Pa \	2-1585.	South Tyger River	106	4,149	3.6	104	.98
Pocoler	2-1590.	" " "	174	6,146	7.8	154	.88
me	2-1595.	Tyger River	351	18,096	18.7	301	.86
81	2-1596.	Dutchman Creek*	8.97	-	-	-	-
Ø	2-1598.	Fairforest Creek*	17.8	_		- 1	_
	2-1605.	Enoree River	307	19,389	12.9	274	. 89
	2-1625.	Saluda River	293	7,109	45.2	403	1.38
	2-1630.	" "	· 405	8,790	36.8	509	1.73
	2-1640.	Reedy River	48.6	2,618	4.5	53.9	1.11
	2-1845.	Whitewater River	47.3	4,459	14.2	114	2.41
	2-1850.	Keowee River	148	13,572	36.8	313	1.89
	2-1850.2	Eastatoe Creek*	30.2	_	-	-	-
	2-1852.	Little River*	72.0	-	-	-	-
	2-1855.	Seneca River	455	16,287	98.2	737	1.62
	2-1860.	Twelvemile Creek	106	3,464	19.4	127	1.20
	2-1870.	Seneca River	1,026	52,415	110	1,291	1.26
	2-1875.	Savannah River	2,231	35,159	50.4	2,749	1.23
	2-1879.	Broadway Creek*	26.4	_	-	-	-

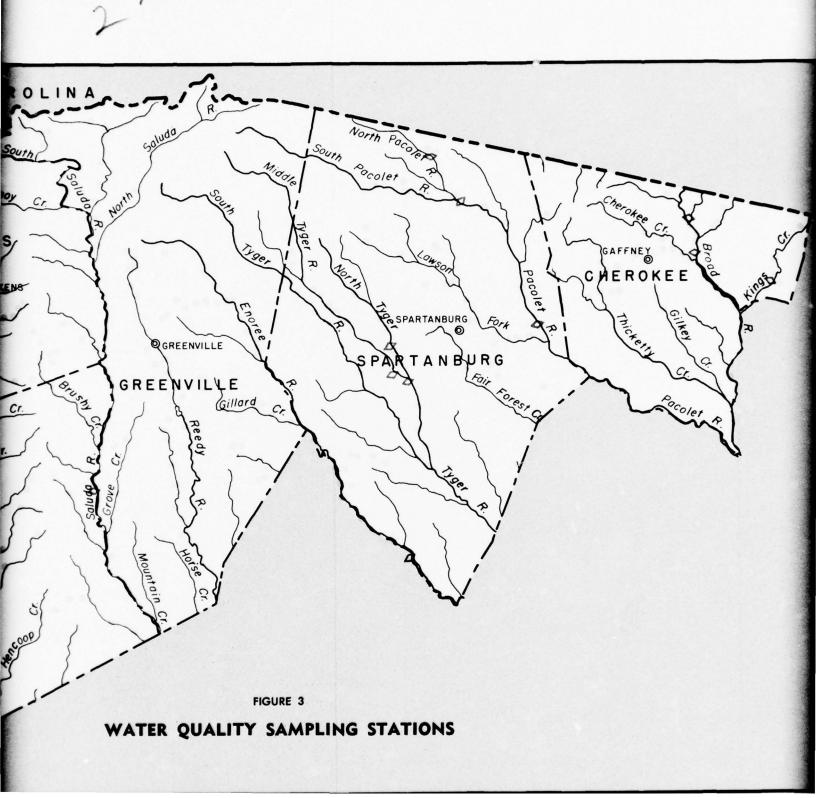
^{*} Station recently established. Records processing incomplete.

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[†] Streamflow subject to regulation.



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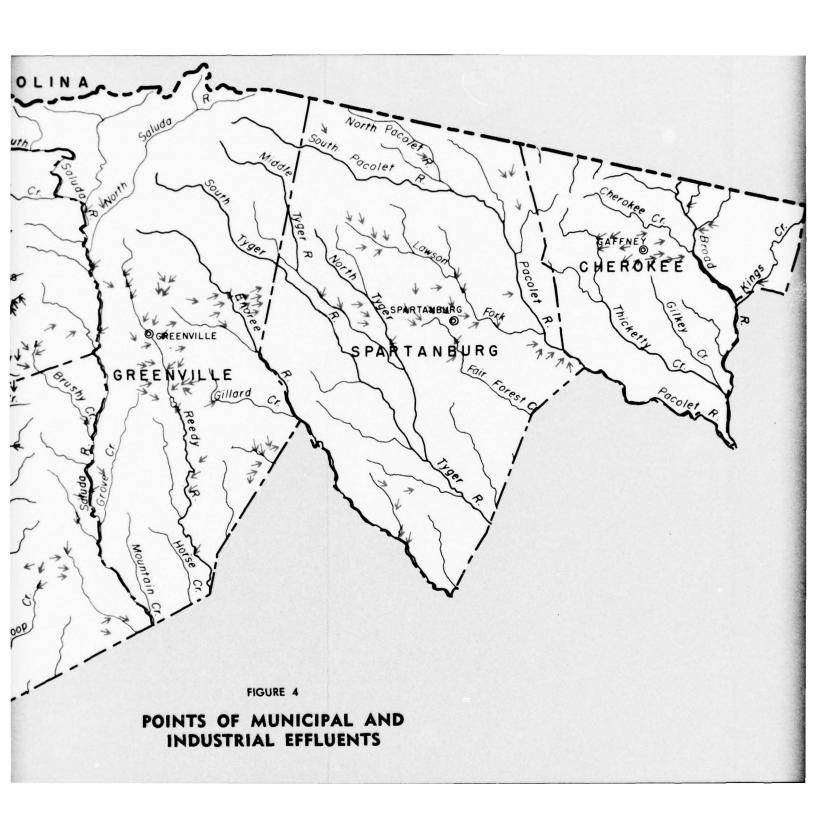


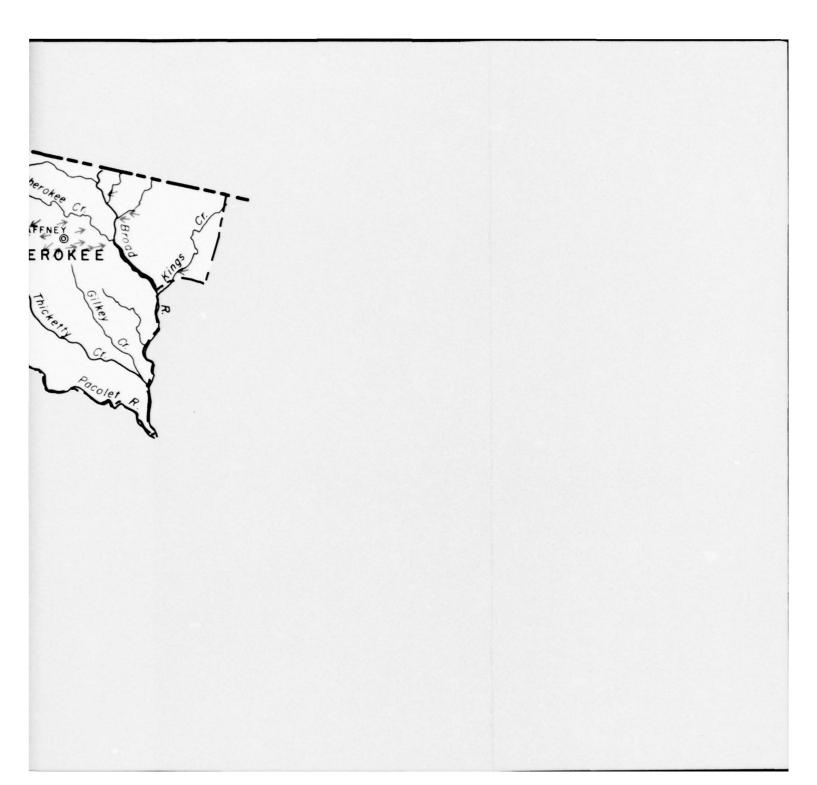
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WPCA Stations

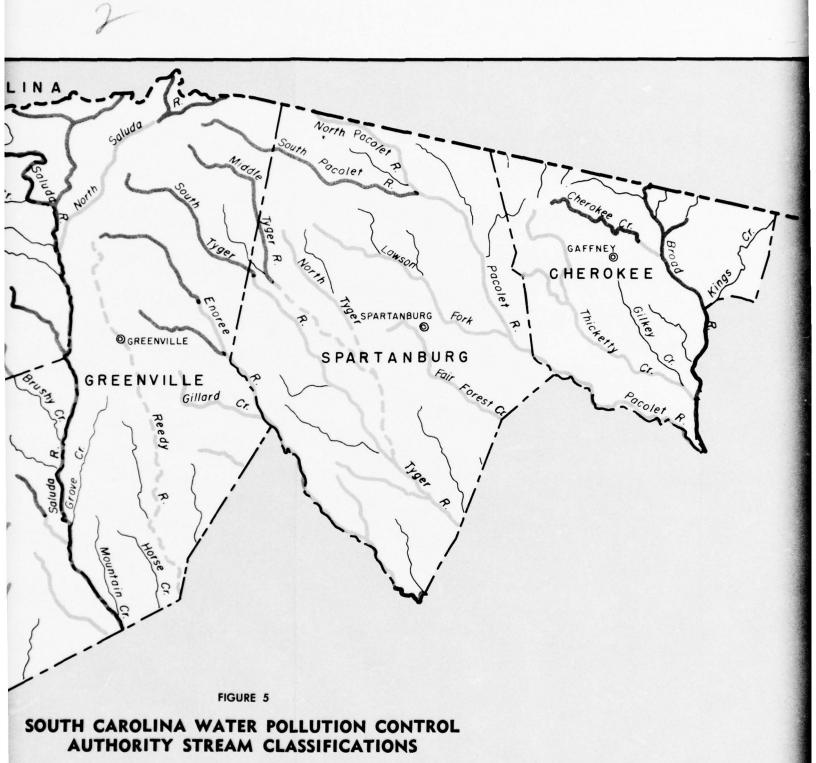
USGS Stations













STREAM CLASSIFICATIONS

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Station No. Name		Period of Record	
2-1625	Saluda River near Greenville	10/1941 to present	
2-1630	Saluda River near Pelzer	9/1929 to present	
2-1870	Seneca River near Anderson	6/1928 to 1/1960	
2-1872.5	Hartwell Res. near Hartwell, Georgia	10/1959 to present	
2-1875	Savannah River near Iva	10/1949 to present	
2-1879	Broadway Creek near Anderson	2/1967 to present	
2-1880	Rocky River near Calhoun Falls	2/1950 to 9/1966	

Low-flow partial-record stations operated by the U.S. Geological Survey, where discharge measurements are made under base flow conditions at infrequent intervals over a period of several years are:

Station No.	Name	Period of Record	
2-1873	Big Generostee Creek near Starr	1951-55	

One or more discharge measurements have been made by the U.S. Geological Survey at each of thirty-five miscellaneous sites on streams within the County.

No comprehensive study has been made by any agency to determine low-flow characteristics on a county-wide basis. However, discharge measurements made at miscellaneous sites during the drought situation in 1954 indicate that streams within the County have good dry-weather yields ranging from about 0.08 to 0.15 million gallons per day.

Data to determine low-flow characteristics are inadequate. Provisions should be made for one additional index stream-gaging station and twenty low-flow partial-record stations for that purpose. A county-wide or larger areal comprehensive study of stream-flow characteristic is essential to economical development of the County's water resources. Low-flow frequency, flow-duration, and flood-frequency relationships should be established on all streams draining more than about ten square miles of surface area.

Ground Water - Some basic data are available covering 163 wells throughout Anderson County. Adequate locations are available on approximately 60 percent of these. Information concerning some hydologic or geologic (aquifer) characteristics are incomplete for approximately 40 percent of the wells.

Drillers logs on eight wells are available at Water Resources Division, U.S. Geological Survey, Columbia, S. C. Also records on five partial and four complete chemical analyses are available.

Additional well data are needed on the existing file of wells. Complete well data are needed on approximately 200 to 300 additional wells. Drillers logs and additional geological mapping are needed to correlate formational units with well yield and water quality. A few observation wells are

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needed to define the seasonal and climatic affect on water-level fluctuation.

Pumping tests on individual wells and more refined pumping tests on groups of wells are needed for adequate determination of such aquifer characteristics as permeability and storage coefficient. The water quality data are entirely inadequate and some 20 to 30 additional complete analyses are a minimal requirement.

Water Quality - The U.S. Geological Survey has operated two chemical-quality stations on streams bordering the county at which a significant amount of information for water-resources planning has been collected. They are:

Station No.	Name	Period of Record	No. of Analyses
2 -1 630	Saluda River near Pelzer	10/53 - 6/66	57
2 -1 875	Savannah River near Iva	10/51 - 3/65	23

In addition to the data cited above, a few analyses have been made on water collected from eight other streams during the 1951 to 1965 period. At Savannah River near Iva, a temperature recorder has been operating from October 1962 to the present.

No data on the sediment transported by streams have been collected by the U.S. Geological Survey.

The approximate number of stream-sampling stations for water quality in Anderson County follows:

Sampling Station	No.
Savannah River System	46
Saluda River System	12

In each case, sampling stations are located on the main stream and on one or more of its tributaries. New stations are assigned as the need indicates.

Data to determine the natural chemical quality and sediment characteristics of streams throughout the county are inadequate. A reconnaissance investigation should be made, either separately or in conjunction with a broader water-resources study. On the basis of the reconnaissance, suitable sites should be selected for periodic collection of chemical-quality and sediment samples.

New problems arise almost daily and must be dealt with firmly. Indications are that new or expanded treatment facilities will be required in the near future for Belton, Honea Path, Iva, Blair Mills, Garrish-Milliken, Pendleton Manufacturing Company, Wellington Mill and the Singer Company.

A number of plants, both industrial and municipal, are presently under construction throughout Anderson County. E. Pod Moore, Hen Coop, Rocky Creek, Broad Mouth Creek, East Beards Creek and Libbard Creek are polluted periodically beyond acceptable limits.

Paragraph III - Cherokee County

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Stream-gaging stations operated by the U.S. Geological Survey on stream within the County or near enough to the County to be significant in water-resource planning are:

Station No.	Name	Period of Record	
2-1515	Broad River near Boiling Springs, N.C.	6/1925 to present	
2-1535	Broad River near Gaffney	10/1938 to present	
2-1555	Pacolet River near Fingerville	10/1929 to present	
2-1560	Pacolet River near Clifton	10/1939 to present	

Low-flow partial-record stations, where discharge measurements are made under base-flow conditions at infrequent intervals over a period of several years, operated by the U.S. Geological Survey are:

Station No.	Name	Period of Record
2-1534.8	Buffalo Creek near Blacksburg	1947-65
2-1536	Kings Creek at Kings Creek	1947-65
2-1537	Thicketty Creek near Gaffney	1958-65
2-1537.05	Thicketty Creek near Thicketty	1949-64

One or more discharge measurements have been made by the U.S. Geological Survey at each of eight miscellaneous sites on streams within the County.

No comprehensive study has been made by any agency to determine low-flow characteristics on a county-wide basis. Available discharge measurements made at miscellaneous sites during the drought situation in 1954 indicate probable ranges in low flow from 0.03 to 0.09 million gallons per day per square mile.

Basic data, particularly in the southern part of the County, are grossly inadequate to reliably determine the low-flow characteristics of streams within the County. Two index gaging stations and at least ten low-flow partial-record stations are needed. A county-wide comprehensive study which would include development of low-flow frequency and flow-duration relationships should be initiated.

Ground Water - Fairly complete hydrologic data are available on 42 wells, concentrated mostly in the Gaffney-Blacksburg area.

Also, drillers logs on 3 wells, all in the Blacksburg area, and two partial and 3 complete chemical analyses on ground water. These are

available at the U.S. Geological Survey, Water Resources Division, Columbia, S. C. Two gamma-ray and one temperature logs are available for two wells.

One observation well, equipped with continuous recorder has been in operation since August 14, 1967.

More complete coverage in basic well data are needed for any adequate appraisal of the County's ground water resource. A minimum of about 100 to 200 wells should be inventoried. Drillers logs and additional geo-physical logs and additional geologic mapping are needed to correlate geologic formation with parameters of well yield and water quality. An additional number of observation wells are needed throughout the county and a continuous water-level record of two to three years duration is required in order to obtain reliable information concerning maximum and minimum elevations of the water table and its relation to climatic factors. An additional 20 to 30 complete chemical analyses are also required.

<u>Water Quality</u> - The U.S. Geological Survey has operated three chemical-quality stations in the County at which a significant amount of information for water resources-planning has been collected. They are:

Station No.	Name	Period of Record	No. of Analyses
2-1534.8	Buffalo Creek near Blacks- burg	2/49-11/64	34
2 -1 535 2 -1 536	Broad River near Gaffney Kings Creek at Kings Creek	2/46 - 6/65 5/49 - 11/64	34 14

In addition, a few analyses have been made on water collected from three other streams during the 1951 to 1965 period.

No data on the sediment transported by streams have been collected by the U.S. Geological Survey.

The approximate number of stream-sampling stations in Cherokee County follows:

Sampling Station		No.	
Broad	River	System	47

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Sampling stations are located on the main stream and on one or more of the tributaries. New stations are assigned as the need indicates.

Data to determine the natural chemical quality and sediment characteristics of streams throughout the County are inadequate. A reconnaissance investigation should be made, either separately or in conjunction with a broader water-resource study. On the basis of the reconnaissance, suitable sites should be selected for periodic collection of chemical and sediment samples.

New problems arise almost daily and must be dealt with firmly. Indications are that new or expanded treatment facilities will be required in the near future for Blacksburg. Canoe and Doolittle Creeks are at the present time polluted beyond acceptable limits. Corrective action has been initiated.

Paragraph IV - Greenville County

<u>Surface Water</u> - Stream-gaging stations operated by the U.S. Geological Survey on streams within the County or near enough to the County to be significant in water resources planning are:

Station No.	Name	Period of Record	
2-1575	Middle Tyger River at Lyman	10/1937 to present	
2-1585	South Tyger River near Reidville	4/1934 to present	
2-1625	Saluda River near Greenville	10/1941 to present	
2-1630	Saluda River near Pelzer	9/1929 to present	
2-1635	Saluda River near Ware Shoals	10/1938 to present	
2-1640	Reedy River near Greenville	10/1941 to present	
2-1650	Reedy River near Ware Shoals	3/1939 to present	

Low-flow partial-record stations, where discharge measurements are made under base-flow conditions at infrequent intervals over a period of several years, operated by the U.S. Geological Survey are:

Station No. Name		Period of Record	
2-1602	Enoree River at Taylors	1952-65	

One or more discharge measurements have been made by the U.S. Geological Survey at each of twenty-nine miscellaneous sites on streams within the County.

No comprehensive study has been made by any agency to determine low-flow characteristics on a county-wide basis. However, discharge measurements made during the drought situation in 1954 indicated that streams within the County have good dry-weather yields - ranging from about 0.09 million gallons per day per square mile in the southern part of the County to about 0.27 million gallons per day per square mile in the mountain region.

Data are inadequate to define low-flow characteristics of many of the small streams within the County. Provisions should be made for one additional gaging station on an unregulated stream and at least ten low-flow partial-record stations, which would provide the basis for a county-wide study of stream flow. Low-flow frequency and flow-duration relationships should be defined so that water use and management could be accomplished efficiently.

Ground Water - Fairly detailed in formation is available concerning the occurrence and quality of ground water obtained in Greenville County as a result of both regional studies and an intensive county-wide investigation. The results of these studies have been compiled in a report which was transmitted to the S. C. State Development Board in April, 1967, for publication as a State bulletin.

This report includes a geologic map showing seven crystalline rock types occurring within the area. Granite and granite-gneiss predominate in the lower half of the county; a band of mica-schist about 2 miles in width extends in a northeasterly direction across the lower half of the county. The northern half of Greenville County is underlain by a gneiss-schist complex in addition to several types of gneissic rocks.

Yields up to 200 gpm are obtained from drilled wells in the hard crystalline rock and yields up to 5 gpm are obtained from dug or bored wells in the overlying mantle of weathered rock or saprolite. The average yield of 500 drilled wells is 17 gpm. Wells drilled in the mica schist or granite gneiss have the highest average yield, about 38 gpm, whereas wells drilled in granite, gneiss-schist complex, biotite-hornblende gneiss, biotite gneiss, and mica granite gneiss have average yields from 15 to 20 gpm. Depths at which maximum yields are developed range from about 150 to 300 feet.

Most ground waters throughout the county are soft; 89 percent of 157 samples analyzed had a hardness less than 60 mg/l. The iron content of 61 percent of the samples ranged from 0 to 0.3 mg/l.

A series of 7 observation wells were used to monitor monthly water levels during the period 1961-63 and one observation well at Fountain Inn has continuous water level records available from 1962 to the present time.

Whereas the ground-water data and interpretation for Greenville County are more complete than any other county in the Appalachian area, affording fairly intensive coverage of this county, there are nevertheless some categories of data that are needed to augment this evaluation. These consist primarily of additional well logs, geophysical logs, pumping tests, and water-quality data.

Water Quality - The U.S. Geological Survey has operated one chemical quality station on a stream bordering the County at which a significant amount of information for water-resources planning is available. It is:

		Period of	No. of
Station No.	Name	Record	Analyses
2-1630	Saluda River near Pelzer	10/53 to 6/66	57

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In addition to the above data, a few analyses have been made on water collected from six other streams during the 1948 to 1965 period.

No data on the sediment transported by streams have been collected by the U.S. Geological Survey.

The approximate number of stream-sampling stations in Greenville County follows:

Sampling Station	No.
Saluda River System	21
Reedy River System	22
Big Durbin Creek	1,
Broad River System	21

In each case, sampling stations are located on the main stream and on one or more of its tributaries. New stations are assigned as the need indicates.

Data to determine the natural chemical quality and sediment characteristics of streams throughout the county are inadequate. A reconnaissance investigation should be made, either separately or in conjunction with a broader water resources study. On the basis of the reconnaissance, suitable sites should be selected for periodic collection of chemical-quality and sediment samples.

New problems arise almost daily and must be dealt with firmly. Indications are that new or expanded treatment facilities will be required in the near future for the Greater Greenville Sewer District and the Brown Packing Company. A number of plants, both industrial and municipal, are presently under construction throughout Greenville County. Reedy River below Greenville, North Saluda River at Slater-Marietta, Laurel Creek and Enoree River are at the present time considered to be polluted beyond acceptable limits.

Paragraph V - Oconee County

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<u>Surface Water</u> - Stream-gaging stations operated by the U.S. Geological Survey on streams within the County or near enough to the County to be significant in water-resource planning are:

Station No.	Name	Period of Record
2-1770	Chattooga River near Clayton, Ga.	10/1939 to present
2-1345	Whitewater River at Jocassee	1/1951 to present
2-1850	Keowee River near Jocassee	12/1949 to present
2-1852	Little River near Walhalla	3/1967 to present
2-1855	Seneca River near Newry	10/1939 to 6/1961
2-1870	Seneca River near Anderson	6/1928 to 1/1960
2-1872.5	Hartwell Reservoir near Hartwell, Ga.	10/1959 to present

Low-flow partial-record stations, where discharge measurements are made under base-flow conditions at infrequent intervals over a period of several

years, operated by the U.S. Geological Survey are:

Station No.	Name	Period of Record
2-1834.9	Chauga River near Westminster	1955 – 65
2-1853	Little River near Salem	1959–65
2-1866	Coneross Creek at Richland	1949 – 65

Also, one or more discharge measurements have been made by the U.S. Geological Survey at each of twenty-four miscellaneous sites on streams within the County.

Although there has been no county-wide study to define low-flow characteristics, discharge measurements made during the 1954 drought situation revealed good dry weather yields - from about 0.22 to 0.32 million gallons per day per square mile.

Ten low-flow partial record stations on selected streams of small drainage area and one index gaging station should be established to define low-flow frequency and flow duration relationships on a county-wide basis. It is believed that the program now underway on a state-wide basis by the U.S. Geological Survey to determine the flood frequency of small streams will provide adequate coverage to determine that relationship in the County.

Ground Water - Basic hydrologic and geologic data for 16 wells scattered throughout Oconee County and one drillers log located near Walhalla are available from the U.S. Geological Survey, Columbia, South Carolina.

There is less ground water information available for Oconee County than for any of the six counties in the Appalachian section. Thus, in order to bring this category of data up to a minimum, additional well data, geologic and geophysical logs, pumping tests and water analyses are needed in almost every part of the County. However, a pertinent consideration is the fact that a considerable section of the county lies in highly mountainous country where the need for detailed information is probably not as great as in areas where industrial or municipal development is progressing at an accelerated rate.

<u>Water Quality</u> - The U.S. Geological Survey has operated three chemical-quality stations on streams within or bordering the County at which a significant amount of information for water resources planning is available. They are:

Station No	. Name	Period of Record	No. of Analyses
2-1834.9 2-1866	Chauga River near Westminster Coneross Creek at Richmond	3/55 - 5/65 12/49 - 5/65	11 14
2-1855	Keowee River near Newry	8/46-3/55	15

In addition to the above data, a few analyses have been made on water collected from six other streams during the 1950 to 1966 period.

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At gaging station 2-1850, Keowee River near Jocassee, a temperature recorder has been operated from October 1961 to the present.

No data on the sediment transported by streams have been collected by the U.S. Geological Survey.

The approximate number of stream sampling stations in Oconee County follows:

Sampling	Statio	on	No.
Savannah	River	System	39

Sampling stations are located on the main stream and on one or more of its tributaries. New stations are assigned as the need indicates.

Data to determine the natural chemical-quality and sediment characteristics of streams throughout the county are inadequate. A reconnaissance investigation should be made, either separately or in conjunction with a broader water-resources study. On the basis of the reconnaissance, suitable sites should be selected for periodic collection of chemical-quality and sediment samples.

New problems arise almost daily and must be dealt with firmly. Indications are that new or expanded treatment facilities will be required in the near future for Excelsior Mill #4, Kenneth Cotton Mill, and Bacon Manufacturing Company.

Paragraph VI - Pickens County

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<u>Surface Water</u> - Stream-gaging stations operated by the U.S. Geological Survey on streams within the County or near enough to the County to be significant in water-resources planning are:

Station No.	Name	Period of Record
2-1625	Saluda River near Greenville	10/1941 to present
2-1630	Saluda River near Pelzer	9/1929 to present
2-1640	Reedy River near Greenville	10/1941 to present
2-1845	Whitewater River near Jocassee	1/1951 to present
2-1850	Keowee River near Jocassee	12/1949 to present
2-1850.2	Eastatoe Creek near Pickens	1/1967 to present
2-1855	Keowee River near Newry	12/1939 to 6/1961
2-1860	Twelvemile Creek near Liberty	7/1954 to 9/1964
		5/1967 to present
2-1870	Seneca River near Anderson	6/1928 to 1/1960
2-1879	Broadway Creek near Anderson	2/1967 to present

Low-flow partial-record stations, where discharge measurements are made under base-flow conditions at infrequent intervals over a period of several

years, operated by the U.S. Geological Survey are:

Station No. Name Period of Record

2-1850.5 Eastatoe Creek near Nine Times 1955, 1959-67

Also one or more discharge measurements have been made by U.S. Geological Survey at each of thirty-seven miscellaneous sites on streams within the County.

A reconnaissance study is being made by the U.S. Geological Survey to determine low-flow characteristics on a county-wide basis. Preliminary indications are that streams in the bunty have good dry-weather yields - ranging from about 0.18 to 0.25 million gallons per day per square mile. The median 7-day low flow on a county-wide basis is about 0.48 million gallons per day per square mile.

Data to determine low-flow characteristics are inadequate. Provisions should be made to continue Twelvemile Creek near Liberty as an indes stream-gaging station and twenty low-flow partial-record stations for about two years. A county-wide or larger areal comprehensive study of stream-flow characteristics is essential to economical development of the County's water resources. While the study of the County, now in progress, will yield the best estimates from available data, it is felt that further sampling of stream flow is necessary, both in point of time and number of measurements, for more justifiable conclusions. Low-flow frequency, flow duration and flood frequency relationships should be established on all streams draining more than about ten square miles of surface area.

Ground Water - Fairly complete hydrologic and geologic data is available on 185 wells located principally in the more heavily populated areas of Pickens County - the southern three-fourths, approximately.

Four drillers logs and twelve complete and 15 partial analyses of well and spring waters have been made.

One water-level observation well in the County is tentatively scheduled for instrumentation.

The county-wide water-resounces study currently being conducted by the Geological Survey should provide a fairly good reconnaissance evaluation of these resources. However, additional data would be required to upgrade the adequacy of this evaluation. These would include additional basic well records, drillers logs, geophysical logs, geologic mapping, representative water samples from springs and wells, and determination of aquifer constants which could be derived from a series of pumping tests.

<u>Water Quality</u> - The U.S. Geological Survey has operated one chemicalquality station on a stream bordering the County at which a significant amount of information for water-resources planning is available. It is:

		Period of	No. of
Station No.	Name	Record	Analyses
2-1855	Keowee River near Newry	8/46 to 3/55	15

In addition to the above data, a few analyses have been made on water collected from 20 other streams during the 1946 to 1967 period.

No data on the sediment transported by streams have been collected by the U.S. Geological Survey.

The approximate number of stream sampling stations in Pickens County follows:

Sampling Station	No.
Savannah River System	30
Saluda River System	11

In each case, sampling stations are located on the main stream and on one or more of its tributaries. New stations are assigned as the need indicates.

A reconnaissance investigation of the water resources of the county is being made by the U.S. Geological Survey. As part of the investigation, samples have been obtained from twelve sites for chemical analysis. At an additional sixteen sites, field measurements of a limited number of chemical-quality parameters have been made.

Data to determine the natural chemical quality and sediment characteristics of streams throughout the County are inadequate. On the basis of the water-resources reconnaissance being made, suitable sites should be selected for periodic collection of chemical-quality and sediment samples.

New problems arise almost daily and must be dealt with firmly. Indications are that new or expanded treatment facilities will be required in the near future for Cannon Mills, Mohasco Mill at Liberty, Sangamo Electric Company and Central. A number of plants, both industrial and municipal, are presently under construction throughout Pickens County. Eighteenmile Creek and Twelvemile Creek are considered to be polluted beyond acceptable limits. Corrective action is now underway.

Paragraph VII - Spartanburg County

<u>Surface Water</u> - Long-term stream-gaging stations operated by the U.S. Geological Survey on streams within the County to provide significant data for water-resources planning are:

Station No.	Name	Period of Record
2 - 1545 2 - 1550	North Pacolet River at Fingerville South Pacolet River Res. near Fingerville	10/1929 to present 3/1930 to present
2-1555	Pacolet River near Fingerville	10/1929 to present

Station No.	Name	Period of Record
2-1556	Buck Creek near Fingerville	7/1966 to present
2-1560	Pacolet River near Clifton	10/1939 to present
2-1563	Lawson Fork Creek near Spartanburg	3/1966 to present
2-1570	North Tyger River near Fairmont	10/1950 to present
2-1575	Middle Tyger River at Lyman	10/1937 to present
2-1580	North Tyger River near Moore	10/1933 to present
2-1585	South Tyger River near Reidville	4/1934 to present
2-1590	South Tyger River near Woodruff	10/1933 to present
2-1595	Tyger River near Woodruff	10/1929 to 9/1956
2-1596	Dutchman Creek near Pauline	7/1966 to present
2-1598	Fair Forest Creek at Spartanburg	3/1966 to present
2-1605	Enoree River near Enoree	8/1929 to present

Low-flow partial-record stations operated by the U.S. Geological Survey where discharge measurements were made under base-flow conditions at infrequent intervals over a period of several years are:

Station No.	Name	Period of Record
2-1561	Lawson Fork Creek near Inman	1959 - 1967

One or more discharge measurements have been obtained by the U.S. Geological Survey at each of seventy-five miscellaneous sites on streams within the County.

The U.S. Geological Survey in cooperation with the Spartanburg County Planning and Development Commission is conducting a comprehensive study of the County's water resources. The results of this project, including a listing of the sources of basic data (notably three sets of discharge measurements made at each of about 50 sites) and significant correlative data from selected long-term stations, will be published as a report of the Water Resources of Spartanburg County. The low-flow characteristics will be defined with such aids to resource utilization as flow duration and low-flow frequency curves, storage required to maintain selected flows and an examination of the effect of regulation of diversion on natural stream flow.

The quantity of data acquired for the program entailed above should be adequate to determine low-flow characteristics per se. However, provision should be made for a "follow-up" investigation of similar design but more limited in scope to be made possibly in 5 years when significant environmental changes have occurred. Provision should be made for the acquisition of discharge measurements and observations of low flow during a severe drought occurrence such as that of 1954. The rapid economic growth and industrial development of Spartanburg County will necessitate its inclusion in a continuing regional study for the most effective utilization of water resources in the Piedmont area.

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Ground Water - Fairly complete hydrologic well data on Spartanburg County are available on 181 wells scattered throughout the county plus very limited data on an additional 30 wells.

Drillers logs are available on four wells in the Duncan and Spartanburg areas, and eleven partial and fourteen complete chemical analyses of well waters.

The county-wide water resources study by the U.S. Geological Survey, currently in progress, should provide a fairly substantial reconnaissance evaluation of the ground-water resources. However, as of the present time, additional well data--principally in such categories as drillers logs, geophysical logs, well cuttings, and pumping tests--together with representative well water analyses are needed to complete or supplement this analysis. In addition, the available geologic maps should be reevaluated for their adequacy in reflecting more accurately the formational boundaries and their relation to the quantity and quality of ground waters characteristic of each particular rock type. Some observation wells are needed in various sections of the county to obtain information concerning the storage capabilities of the aquifer and climatic effects on water-level fluctuations.

<u>Water Quality</u> - The U.S. Geological Survey has operated seven chemical quality stations on streams within or bordering the County at which a significant amount of information for water-resources planning is available. They are:

Station No.	Name	Period of Record	No. of Analyses
2-1545	North Pacolet River at Fingerville	9/46-4/65	21
2-1555	Pacolet River near Fingervill	e 12/50-4/65	64
2-1560	Pacolet River near Clifton	2/46-11/67	14
2-1570	North Tyger River near Fairmont	2/51-11/67	16
2-1580	North Tyger River near Moore	2/46-4/65	47
2-1590	South Tyger River near Woodruff	2/46-4/65	24
2-1605	Enoree River near Enoree	2/46-6/65	32

In addition to the above data, analyses have been made on water collected from 29 other streams during the 1946 to 1967 period.

Temperature recorders have been operated at Enoree River near Enoree from November 1966 to the present and at North Tyger River near Fairmont since October 1966.

Four daily suspended sediment stations have been operated by the U.S. Geological Survey in the County. They are:

Station No.	Name	Period of Record
2-1580	North Tyger River near Moore	6/1934 to 6/1938
2-1585	South Tyger River near Reidville	6/1934 to 6/1938
2-1590	South Tyger River near Woodruff	6/1934 to 6/1938
2-1595	Tyger River near Woodruff	6/1934 to 6/1936

The approximate number of stream sampling stations in Spartanburg County follows:

Sampling Station	No.
Enoree River System	14
Tyger River System	30
Fair Forest Creek	12
Pacolet River System	27

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In each case, sampling stations are located on the main stream and on one or more of its tributaries. New stations are assigned as the need indicates.

An investigation of the water resources of the county is currently being made by the U. S. Geological Survey. As part of the investigation, samples have been obtained for chemical analysis from 25 stream sites. As an additional 37 sites, field measurements of a limited number of chemical-quality parameters have been made. Sediment data collected during the 1934 to 1938 period have been summarized, but conclusions based on these data may not be applicable to present conditions.

Data obtained during the present investigation are adequate for a general appraisal of the chemical quality of water throughout the County. On the basis of the investigation, suitable sites should be selected for periodic collection of chemical quality and sediment samples.

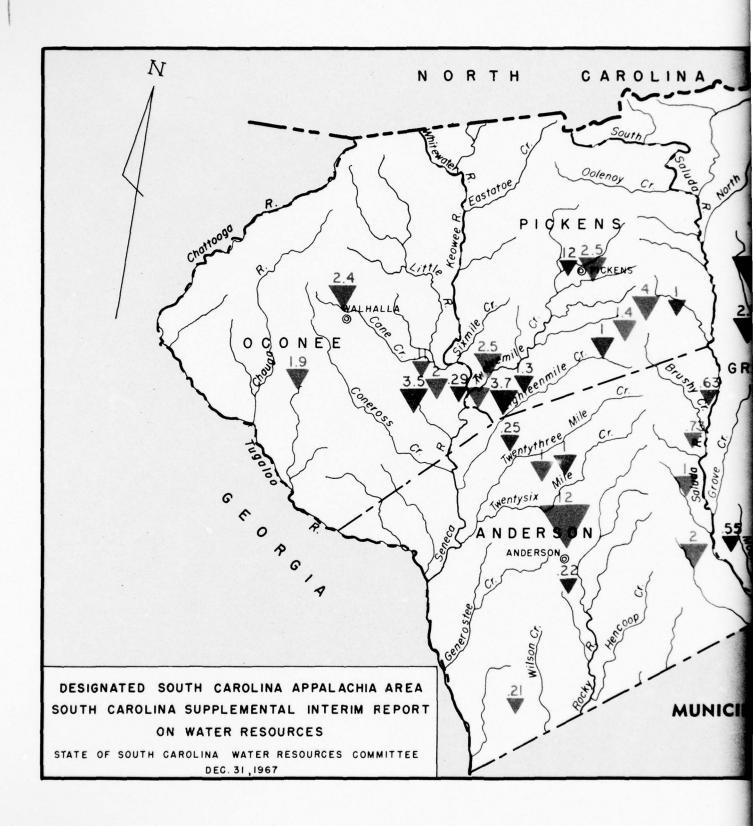
New problems arise almost daily and must be dealt with firmly. Indications are that new or expanded treatment facilities will be required in the near future for Fingerville, Spartanburg, Mayfair Mill, Clifton Manufacturing Co. (Converse), Franklin Process Co., Spartan Grain and Mill Co., and Startex Mill. A number of plants, both industrial and municipal, are presently under construction throughout Spartanburg County. North Tyger River, South Tyger Creek, Maple Creek, Middle Tyger River, Jimmie's Creek and Pacolet Rivers are polluted periodically beyond acceptable limits.

CHAPTER VII

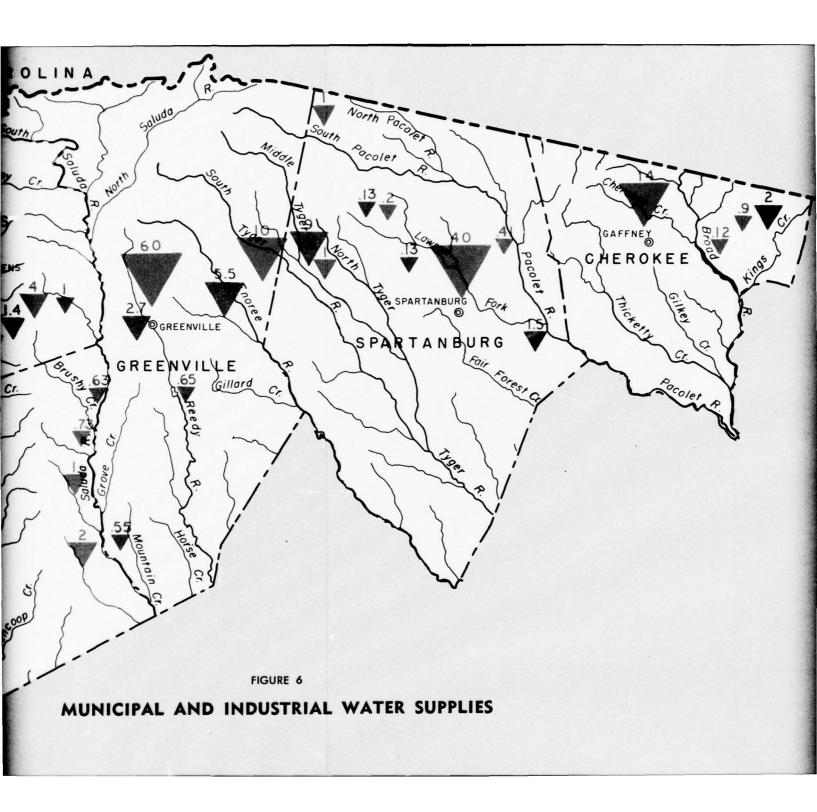
PRESENT WATER USE AND SOURCE

The six South Carolina Counties in Appalachia are almost entirely dependent on surface water for all uses. A limited ground-water supply is the source of water for most rural homes, and a few small industries with low water requirements. Water for agricultural purposes such as for irrigation and livestock is a product of small and medium size farm ponds

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WATER TREATMENT PLANT CAPACITIES IN MILLION GALLONS PER DAY



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constructed in the area. According to the most recent USDA Conservation Needs Inventory, there is a total of 16,136 surface acres of these small reservoirs in the six-county area.

The present use of water by the principal water users, and the source of supply, was determined by making direct contacts with responsible individuals and groups who are in a position to provide a most authoritative report on present water use. The data obtained from these contacts and interviews was supplemented by researching data previously obtained by the Department of Agricultural Economics, Water Resources Research Institute, Clemson University, Clemson, S.C., of the Broad River Basin, North and South Carolina as well as data provided by the S.C. State Board of Health and the U.S. Farmers Home Administration.

Table 1. - Present surface water use (MGD)

County	Municipal	Industrial	Rural*	Total
Anderson	6.600	2.212	.084**	8.896
Cherokee	2.815	3.730	2.700	9.245
Greenville	14.400	6.300		20.700
Oconee	6.331	4.722		11.053
Pickens	6.063	4.111		10.174
Spartanburg	26.250	14.078	4.05	44.378
Total	62.459	35.153	6.834***	104.446

^{*}Greenville, Oconee, and Pickens use municipal water.

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The rapid development of rural water districts over the past five years is a factor in present water use in some counties. For instance, in Cherokee County, water for rural systems represents about 30% of the total present water used in the county for all purposes. In the six-county Appalachia area, municipal users represent about 60%, and industrial users about 34% of the total water usage. Present use of ground water is not presented due to the lack of reliable data. It is obvious, however, that the trend in some counties, such as Anderson and Oconee, to develop residential areas in the rural fringes of urban areas with ground water as a source for public water systems presents a potential problem in future planning.

SECTION VIII - ANTICIPATED FUTURE WATER NEEDS

The future water needs of the six South Caroline Appalachia Counties must be recognized if the anticipated economic development of the area is to become a reality. The 1968 State Development Plan for South Carolina Appalachia envisions that there will be areas of growth of various

^{**}Ground water.

^{***36} rural water systems.

intensities throughout the six counties; that there will be a wider diversification of industry; and that there will be an acceleration of the change from rural to urban environments. (Figure 7) These projected changes, separately or in combination, directly influence the future water needs of the Area involved. Furthermore, population projections for the six counties indicate that by 2020 the population will have doubled, with more than two-thirds of the total in the Greenville, Spartanburg, Cherokee area. 1 Consequently, the greatest demand on water resources in the future will be in this area. The Anderson, Pickens, and Oconee area will experience a similar acceleration in population and water requirements. The density of urban and industrial development in this three-county area, however, will not be as intense as in the Greenville, Spartanburg and Cherokee area.

As growth develops, so will the need for water for municipal, industrial, pollution control, and recreation and wildlife. Therefore, new sources of water will have to be located and developed. Existing sources will also need to be more fully utilized with adequate distribution and treatment facilities. Rural Water Districts and urban residential developments now depending on ground water as a central supply may find that surface water sources are more practical for further development and expansion. An increased demand for water for waste treatment will develop as these areas continue to grow and become more numerous.

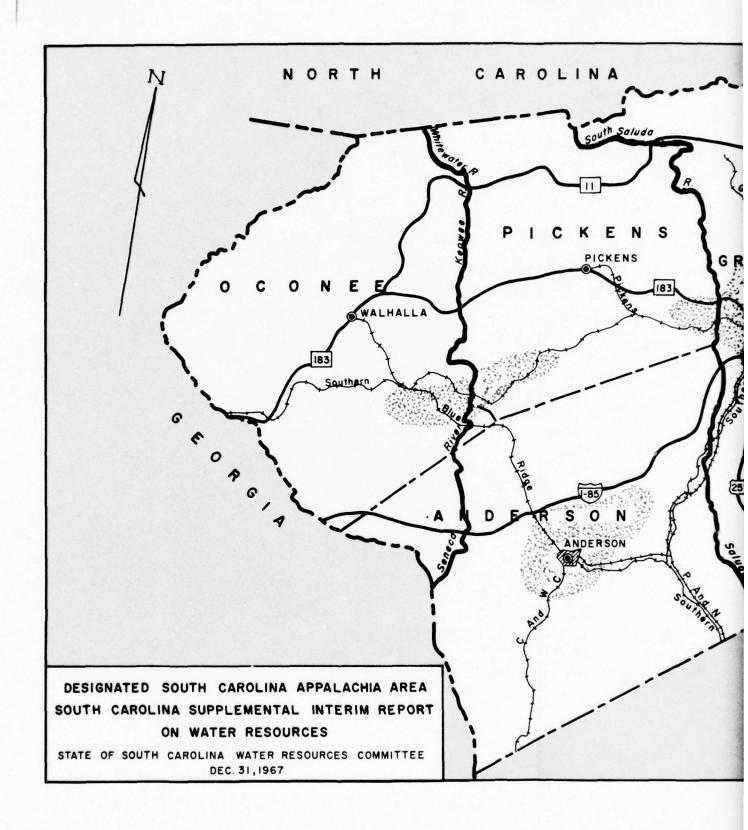
Specific estimates of future water requirements cannot be made with any degree of accuracy or dependability as daily water requirements per capita are increasing each year. It may or may not be true that water-saving technology will advance directly in proportion to the rate that labor-saving technology advances. There is no question, however, that water requirements for pollution control and recreation will become a very significant factor in planning for future water resources consistent with the projected groth of the Appalachia Area.

SECTION IX - PRESENT DEVELOPMENTS OF WATER RESOURCES

Paragraph I - Storage Facilities

Within the six county area of Appalachia in South Carolina there are eleven water storage reservoirs that have a surface area exceeding 100 acres. These are listed in Table 2 along with location, ownership, purpose, and physical capacity. The largest development, Hartwell Reservoir, is a multiple purpose project primarily for power generation. Completed in 1962 the initial installation of four 66,000 kilowatt units to generate 453,000,000 kilowatt hours annually.

¹/Department of Agricultural Economics, Clemson University, Clemson, S. C.



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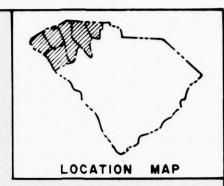
FIGURE 7

AREAS OF POTENTIAL GROWTH

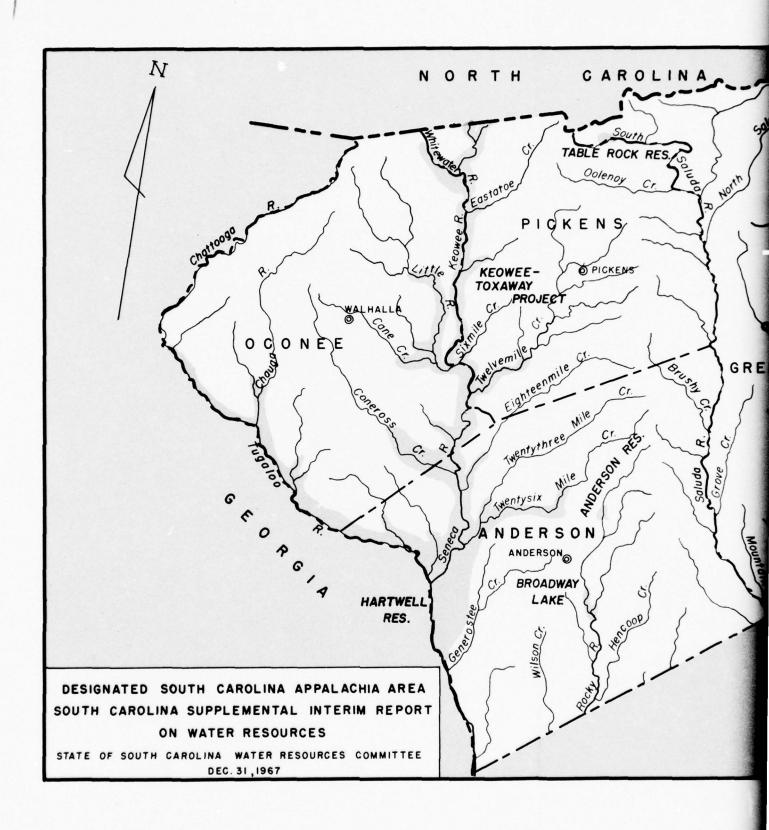
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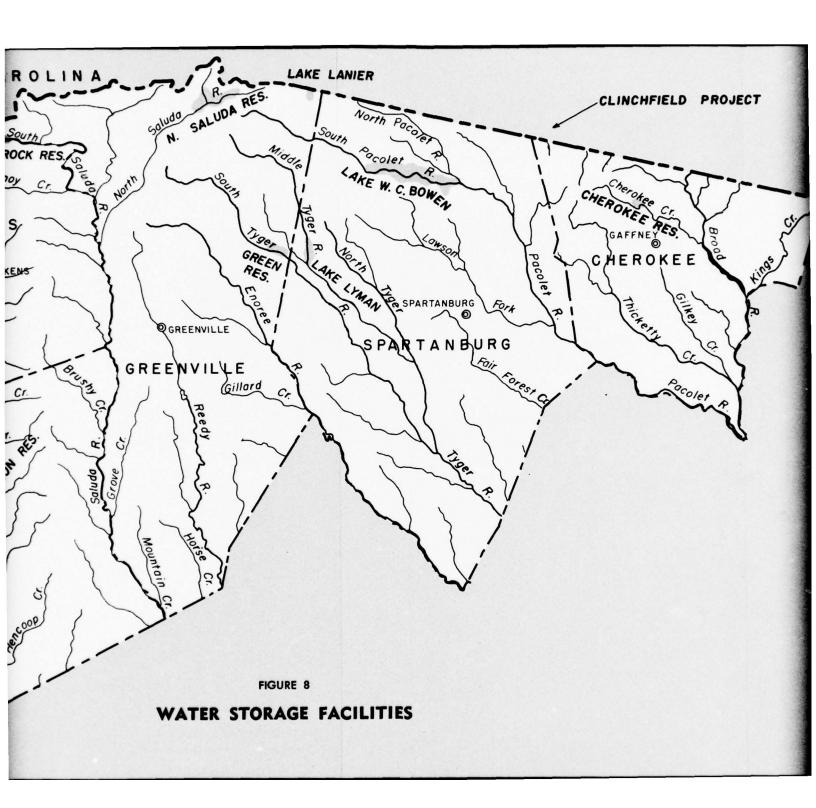




AREAS OF POTENTIAL GROWTH - 1968



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The Keowee-Taxaway project, when completed in 1970, will combine hydroelectric and pumpted storage generation with nuclear steam generation. Supplementing the contribution of other reservoirs in the area, the Keowee-Toxaway project will provide excellent opportunities for the development of recreational and water supply facilities. Other anticipated benefits include flood control, soil and water conservation, including fish and wildlife enhancement.

While all reservoirs are probably used for more than one purpose, seven were built primarily for water supply. The Greenville reservoirs located in the mountain area are restricted to water supply only. The Spartanburg reservoir primarily for water supply was also planned to provide for recreation needs. The more recent projects and those planned are being more fully developed. The State's position is that all water resource projects in South Carolina should be developed to their maximum potential.

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Table 2 Appalachian South Carolina Reservoirs.

T OT GT STG	MAGGEOR	GLANDSHID	TO OCT II	PHYSICAL CH	PHYSICAL CHARACTERISTICS
nesenvorn	TINTING C	OWNERDILLE	ronfobe	acres	(acre feet)
Hartwell	Savannah	Federal	power generation flood cont. recreation water supply	56,400 (37,300 in s. c.)	2,858,000
Table Rock	S. Saluda	Municipal (Greenville)	water supply		29,000
North Saluda	N. Saluda	Municipal (Greenville)	water supply		77,000
Greer	S. Tyger	Municipal (Greer)	water supply		
Lake William C. Bowen	S. Pacolet	Municipal (Spartanburg)	water supply recreation	1,800	28,000
Gaffney	Cherokee	Municipal (Gaffney)	water supply recreation	200	

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Table 2 Appalachian South Carolina Reservoirs. (cont.)

RESERVOIR	STREAM	OWNERSHIP	PURPOSE	PHYSICAL C surface acres	PHYSICAL CHARACTERISTICS surface storage acres (acre feet)
Lake Lyman	Middle Tyger	Lyman Wills	water supply recreation		
Broadway Lake	Broadway	Public	recreation	300	
Keowee- Toxaway	Кеомее	Private (Duke Power)	power recreation flood cont.	25,500	2,058,600
Anderson	Big Beave rda m	Private (Duke Power)	water supply flow regulation		2,000
Lake Lanier	Vaughn	Private	recreation		

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Paragraph II - Small Watershed Projects

The United States Department of Agriculture is currently updating a Conservation Needs Inventory made in 1958-60. This inventory, which is essentially complete for South Carolina, consists of two phases; one of which is watershed project needs. In the Appalachian area of South Carolina, estimates have been made for each watershed having flooding, erosion, or drainage problems. The needs for non-agricultural water management were also indicated. These include such needs as: municipal, industrial, recreational, water quality, and fish and wildlife. After considering future needs along with current problems and needs, each watershed was considered as to its potential as a small watershed project.

Appalachian South Carolina contains all or portions of 74 designated watersheds. Eight of the thirty in the Savannah River Basin, seven of the eighteen in the Saluda, three of six in the Tyger, and two of twelve in the Broad River Basin have requested assistance from the United States Department of Agriculture watershed programs. The present status of each individual watershed project is indicated in Table 3. Storage potential for the remaining watersheds in Appalachia are shown in Table 4.

At the present time, of the 20 applications received for watershed assistance, four have been completed and six have structural measures under construction. These ten projects contain a total of 56 dams. Generally, the 56 dams could have been constructed to contain 40 percent more storage. In most cases the structures have been designed to contain only flood and sediment storage. Due to this underdevelopment, approximately 43,000 acre feet of water storage has been lost.

Under existing planning criteria 37 of the designated watersheds are considered feasible for Public Law 566 projects. It is anticipated that both existing planning criteria and conditions will change. These changes will result in additional feasible watershed projects. The continued interest in the watershed program indicates that by 1980 structures will have been built in a total of eighteen watersheds, by 2000 ten more, and by 2020 a total of 38 watersheds should have completed structures.

The status of the stream channel improvements program as associated with the small watershed projects in Appalachian South Carolina is shown in Table 5.

Paragraph III - Waste Treatment Facilities

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During past years many of the streams of Appalachia have been subjected to pollution. This pollution has varied in both type of pollutants and in the intensity of pollution. Corrective action has been taken over the years, and many of the serious problems have been resolved. However, serious pollution problems still exist in the area. Several of the more critical problems were detailed in the county descriptions of Section VI. The locations of existing municipal and industrial effluents are shown on figure 4. The more recent developments in the planning and construction of additional waste treatment facilities in the area are indicated in Table 6.

Table 3 Storage - small watershed projects.

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		Drainage sq. mi	inage Area	St	Storage -	Acre Feet	Feet	
Watershed	County	Total	Con- trolled	Flood & Sediment	Other Total	Total	Additional Capacity Potential	Remarks
SAVANNAH BASIN Beaverdam	Anderson	37.9	16.4	7330		5.360	5,000	4 structures
Creek	Oconee	(-)(•	1,030		2000	2001	planned
Coneross Creek	Oconee	67.6	22.7	4,325		5,265	2,600	Project complete. 4 structures built
Twelvemile Creek	Pickens	105.2	33.8	7,630 910		8,540	7,600	Pilot project complete, 7 structures built.
Three and Twenty Creek	Anderson Oconee	4.28	40.2	7,860 2,695		10,555	5,300	Construction started or completed on 7 structures.
Wilson Creek	Anderson	33.9	12.5	2,680		3,440	2,700	Construction started or completed on 5 structures.
Golden Creek	Pickens	15.5	6.1	$\frac{1,600}{400}$		2,000	2,900	Application submitted.
Rocky River	Anderson	179.7	85.7	21,920 5,480		27,400	41,100	Application submitted.
Barkers Creek	Anderson	18.3	15.0	2,560		3,200	4,700	Application submitted.

Table 3 Storage - small watershed projects. (cont.)

		Drainage A	ge Area mi.	St	Storage,	Acr	Acre Feet	
Watershed	County	Total	Con- trolled	Flood $^{\&}$ Sediment Other Total	Other	Total	Additional Capacity Potential	Remarks
Eighteen- mile Creek	Pickens Anderson	7.94	30.2	7,595 2,050	1,630	1,630 11,275	10,430	Water Re- sources survey complete.
SALUDA BASIN								-
Brushy C r eek	Anderson Pickens	36.7	16.7	2,560		2,960	5,800	Project com- plete. 4 structures built.
Huff C r eek	Green- ville	34.0	22.7	4,330		5,270	5,600	Project complete, 5 structures.
George's Creek	Pickens	31.8	12.9	3,000		3,350	2,400	<pre>5 structures planned - Construction started.</pre>
Big Creek	Anderson	20.7	7.8	1,600 520	730	2,850	1,300	2 structures planned - Construction started.
Broad- mouth Creek	Anderson	29.1	8.1	1,840 200		2,040	1,600	4 structures planned - Construction started.
Oolenoy C r eek	Pickens	52.6	4.4 2	$\frac{7,180}{1,790}$		8,970	10,630	Application submitted.

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Table 3 Storage - small watershed projects, (cont.)

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Acre Feet	Additional Remarks Capacity Potential	3,700 Application submitted.		6 structures planned - construction started.	Water Resources Survey completed - N. Tyger application submitted.	Watershed In- ventory Report completed - Sugar Creek application
	Total	2,500		8,216	9,195 45,145	4,730 22,000
Storage	Other Total			108	9,195	4,730
	Flood & Sediment	2,000		6,823	31,350 4,600	13,300 3,970
Drainage Area sq. mi.	_ 11ed	2.2		33.9	169.4 135.2	9.47
Draina sq.	Total	18.0		59.6	169.4	102.4
	County	Green- ville		G r een- ville	Spartan- burg Green- ville	Spartan- burg
	Watershed	Rabon Creek	TYGER BASIN	Upper South Tyger River	North & Middle Tyger River	Fairforest Creek

Table 3 Storage - small watershed projects. (cont.)

		Draina	Drainage Area					
		sq.	sq. mi.	S	torage	Storage Acre Feet	e Feet	
Watershed	County			Flood	_		Additional	Remarks
		Total	Con- trolled	3ediment Other Total	Other	Total	Capacity Potential	
BROAD RIVER BASIN								Application
North and South	Spartan- burg	157.9	44.1	12,260	7.425	7,425 23,100	1,40	submitted, Water Resources
Pacolet River	Green-			3,415				Survey complete for South
								Pacolet.
Thickettv	Spartan- burg							9 structures planned -
Creek	Cherokee	kee 116.7	49.1	1,655	2,060	2,060 11,865	1,400	construction started.
Cherokee		25.6	10.2	2,948		3,685	3,685 3,300	Water Resources Survey complete
Creek	Cherokee	- 1	- 1	(3)				,

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L. 566 project status. Storage potential - Watersheds without P. Table 4.-

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MEGAG	VMINIDO	DRAINA (sq	DRAINAGE AREA (sq.m1.)	STORAGE	-	(acre feet)
NICHO	COUNT	Total	Controlled	Flood & Sediment	Total	Additional Capacity Potential
Savannah 21 watersheds	Anderson Oconee Pickens	1,986.6	255.6	64,080 16,020	80,100	135,000
Saluda 11 watersheds	Anderson Greenville Pickens	535.1	183.5	50,240 11,760	62,000	78,800
Enoree 8 watersheds	Spartanburg Greenville	252.9	69.0	12,600	22,000	33,300
Tyger 3 watersheds	Spartanburg Greenville	185.7	83.4	21,360 5,340	26,700	18,500
Broad 9 watersheds	Cherokee Spartanburg	0.894	184.6	45,150 11,280	56,430	84,600

Table 5 Stream channel improvement work in six-counties Appalachian area-South Carolina

WATERSHED	STREAM CHAN	NEL IMPROVEMENT es)
Name	Planned	Installed
ANDERSON COUNTY		
Brushy Creek Big Creek Broadmouth Creek	9.3 4.3 11.2	9.3 1.7 4.8
Rocky River Wilson Creek Beaverdam Creek Eighteenmile Creek	5.2 3.3 3.9	1.6
CHEROKEE COUNTY		
Thicketty Creek	11.2	
GREENVILLE COUNTY		
South Tyger River Huff Creek	14.5 1.6	1.5 1.9
OCONEE COUNTY		
Beaverdam Creek Coneross Creek	8.1 14.7	14.7
PICKENS COUNTY		
George's Creek Twelvemile Creek Eighteenmile Creek	6.2 32.5 7.1	3 2•5
SPARTANBURG COUNTY		
South Pacolet River North Tyger River Fair Forest Creek	9.0 18.8 3. 9	

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Table 6 - Recent development in waste-treatment facilities.

MUNICIPAL

Planning underway	Plans complete	Construction started
Iva Blacksburg Travelers Rest Greenville Westminster Pickens Woodruff Duncan Cowpens	Honea Path Gaffney Taylors Spartanburg	Anderson Simpsonville Mauldin Greer Fountain Inn Walhalla Easley Lyman
	INDUSTRIAL	
Planning Underway	Plans complete	Construction started
Sangamo Electric Franklin Process	J. P. Stevens Co.	Owens Corning Fiberglass
Company		Dow Badische Co.
		Westinghouse
		Wunda-Weave Carpet Company
		Fiber Industries
		Cambell Limestone
		Mohasco Mill
		Butte Knitting

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Mills, Inc.

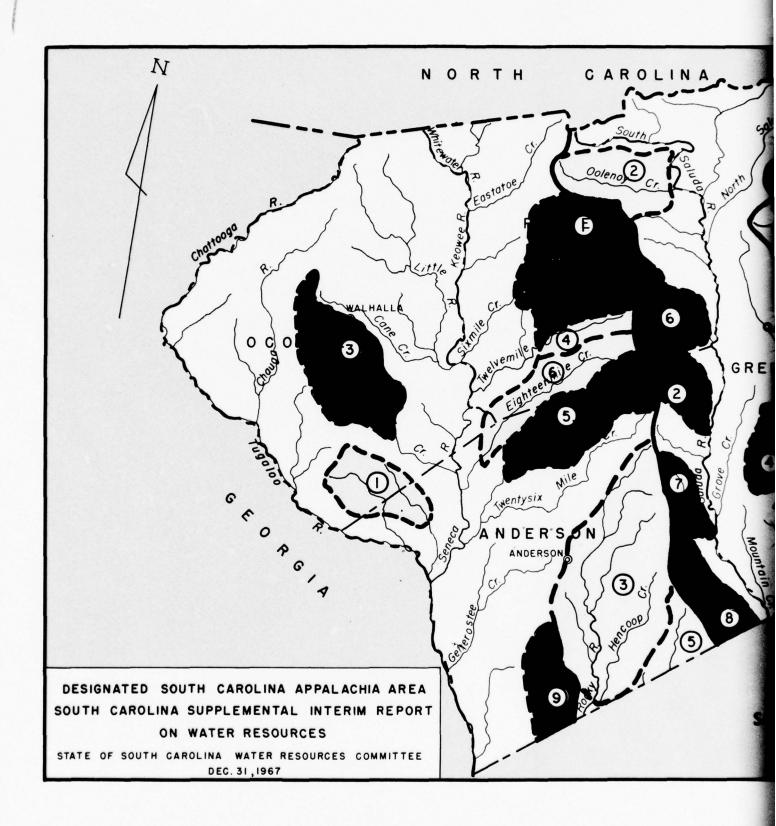
Table 7.- Summary of National Forest facilities in South Carolina Appalachia.

Sun	ter Nationa	l Forest	
Name of Area	Boating	Fishing	Swimming
Chattooga		X	
Cherry Hill		х	
Sloan Bridge		Х	
Yellow Branch			Х
Parson's Mountain Lake	Х	Х	х
Broad River	Х	Х	Х

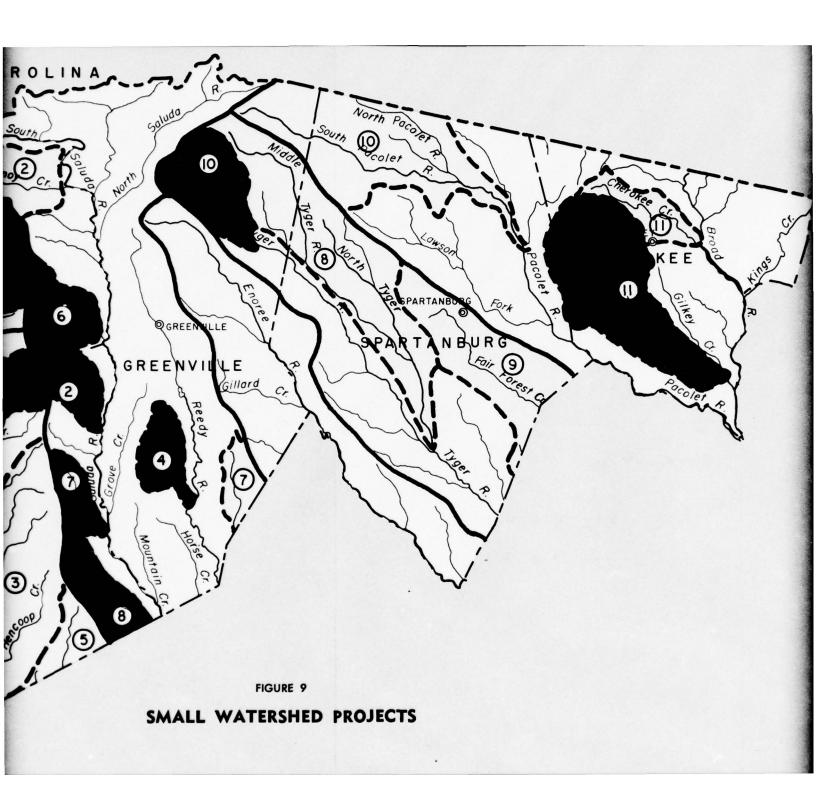
Table 8.- Summary of State Park facilities in South Carolina Appalachia.

Park	Area (Acres)	% in active use	Boating	Fishing	Swimming
Croft	7,088	35%		Х	Х
Oconee	1,165	35%	Х	Х	Х
Paris Mtn.	1,275	40%	Х	Х	Х
Pleasant Ridge	300	40%	х	х	Х
Table Rock	2,860	25%	Х	Х	Х
Sadlers Cr.	625	undevel- oped			

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- 1. Twelve Mile Creek (Pilot)
- 2. Brushy Creek
- Coneross Creek
- 4. Huff Creek
- 5. Three and Twenty Creek
- 6. Georges Creek
- 7. Big Creek 8. Broadmouth Creek
- 9. Wilson Creek 10. Upper South Tyger River 11. Thicketty Creek



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PLANNING COMPLETE OR IN PROGRESS

- 1. Beaver Creek
- Oolenoy Creek
 Rocky River
- 4. Golden Creek
- 5. Barkers Creek6. Eighteen Mile Creek7. Rabon Creek
- 8. North and Middle Tyger River
- 9. Fair Forest Creek
 10. North and South Pacolet River
 11. Cherokee Creek

Paragraph IV - Recreation and Recreational Fishery Resources

South Carolina Appalachia offers a great variety of outstanding recreational potential. The climate and the location of the area, just within and adjacent to the beautiful Blue Ridge Mountains, provides for the basic resources of scenery, land, and water necessary for outdoor recreation. The six-county area contains in excess of 50,000 acres of impounded water and approximately 1,100 miles of streams that are available for water-based recreation. Hartwell Reservoir, the largest single impundment, has 56,400 surface acres of which 37,300 are in South Carolina. The Keowee-Toxaway project, when completed in 1970, will provide an additional 25,500 surface acres for recreation. These, and other reservoirs, are shown in figure 8 and are briefly discribed in Table 2. Also within the six-county area are numerous small, privately owned fishing lakes. A summary of the recreational facilities available in the State Parks and Sumter National Forest are in Tables 7 and 8.

Recreational fishing essentially means the use of hook and line to take fish, with the principal benefit being the satisfaction of the angler.

Today angling represents one of the major forms of recreation in the Appalachian region. Fishing, as a diversion, contributes much toward the mental and physical health of the people of this region and is essential to the health of future generations. For this reason it is important that plans be made to conserve and increase this resource so as to insure future generations ample opportunities to fish.

It is the objective of this study to evaluate the present status of recreational fishing in this region and to predict future needs in the face of present population growth trends.

In order to clearly define this resource certain quantitative values must be associated with it to be used as a clear index of the resource's abundance or magnitude. A fisherman trip will be used for the purpose of evaluating the fishery resources to be considered in this report.

The average fisherman trip varies widely in tenure and total catch; the average trip for this region lasts between three and four hours and realizes a catch of 1.2 pounds of fish.

The sport fishing potential of a body of water depends wholly upon its basic fertility which directly controls its capability to produce an annual crop of fish. Levels of productivity vary widely with different localities and water types. However, once annual productive levels have been determined through various sampling techniques for a body of water, we can estimate the number of average fishermen trips this resource can support.

Surface waters in Appalachia may be categorized as static or flowing, warm or cold, public or private. For the purposes of this report, the contribution these different water types make toward the total recreational sport fishery of this region is described in terms of total pounds

Table 9.- Status of fishery resources in South Carolina Appalachia 1967.

Type water	Total acres	lb./ Acre	Total lbs.	lb./ Trip	Fisherman trips
STREAMS					
Cold Water Warm Water RESERVOIRS	1,100 2,700	23.0	21,200 52,100	.7 1.5	30,300 34,700
Public Private	39,800 5,400	16.0 35.0	636,400 190,500	1.3	489,800 176,600
TOTAL	49,000	18.5	900,200	1.2	732,400

of fish produced and potential number of fishermen trips this annual crop is capable of supporting. Table 9 lists the total surface acres under the appropriate categories and their potential fishery.

Cold vater streams are those waters which are managed for and are capable of supporting trout. They exist in the mountainous regions at Oconee, Pickens, and Greenville Counties and in the trailrace of Hartwell Dam. Intensively managed, they are stocked annually with 150,000 trout and receive nearly 40,000 fishermen trips each year.

This is a very limited resource, unique to this part of the country. However, these waters are constantly being reduced through rublic and private development of their watersheds. Special measures will have to be taken to curb this encroachment and to insure their preservation.

Streams supporting populations of warm water species, notably the sunfish family, are designated as warm waters. Generally they are more productive than cold water streams but at present much less intensively managed. In Appalachia they cover some 2,700 acres, nearly three times that of cold water streams.

Today, their productivity and attractiveness have often been reduced through pollution and it is reasonable to assume that the production of this resource is below potential levels.

Public reservoirs represent 80% of all fishable waters in this region. They serve many purposes; some were built by the South Carolina Wildlife Resources Department primarily for fishing, while others provide municipal water supplies and hydro-electric power.

Our biggest single body of fresh water, Hartwell Reservoir, is included under this category and represents over 70% of all surface waters of this region. An estimated 37,000 acres of Hartwell Lake lie within the boundaries of South Carolina. Although far from being fully utilized, its sport fishery produces 170,000 pounds of fish annually. Fishery research programs indicate that this lake is capable of producing an annual crop of nearly 600,000 pounds of fish. Hartwell Lake in itself represents a tremendous potential with the capacity to absorb considerable increases in future angling demands.

Private reservoirs, usually called farm ponds, number 3,600. They are probably our most productive and support an important segment of the fishery. In 1967 they provided nearly 180,000 fishermen trips producing a total catch of 190,000 pounds. These small ponds lend themselves well to intensive management which will result in considerable increases in their productivity as more owners become better educated in the procedures of farm pond management.

At present, an estimated 11% of the population fishes at least once during the year. These 88,300 fishermen took nearly 400,000 fishing trips in 1967 and caught 453,000 pounds of fish.

The potential of these same waters is placed at 900,000 pounds of fish, double the present-day levels of harvest. This is not so evident in the smaller public lakes situated close to densely populated areas which are generally very heavily utilized and are at their full capacity. This points out the significance of availability and a need for more waters situated closer to the larger municipalities.

SECTION X - FUTURE DEVELOPMENT OF WATER RESOURCES

Paragraph I - General

The total future development of the Appalachia area of South Carolina will offer unusual opportunities and challenges for water resource development. The more mountainous areas of the Blue Ridge province have an abundance of rainfall and the runoff from the steep rugged slopes is substantial. The Piedmont, with lower elevations and gently rolling topography, contains several excellent sites for reservoirs—thus creating many varied possibilities for water resource development.

The water resource potentials of the area have been recognized and considerable progress has been made in their development. At the present time, there is an urgent need for additional developments. The population is expected to more than double by the year 2020. These population projections indicate not only the capacilities of South Carolina Appalachia for social and economic growth but also the opportunity and necessity for such growth. This needed future development, including the best use of present water resource programs and projects, can only be achieved through coordinated comprehensive planning.

Paragraph II - Hartwell, Keowee-Toxaway Projects

It is not contemplated that the western portion of South Carolina Appalachia--Anderson, Oconee, and Pickens Counties--will have any serious future water-supply source problems. The Hartwell Reservoir, completed by the Corps of Engineers in 1962, and the Keowee-Toxaway Project, presently under construction by Duke Power Company, promise to provide this area an abundant supply of water for future development and growth. It remains for units of government and private groups, in their long-range plans for growth and development, to fully utilize these sources of water. Such planning will include the necessary distribution and treatment facilities to provide an ample supply of good quality water to those areas where a shortage of this resource will retard the development of the area.

In addition to providing an abundant supply of water for surrounding areas, the Keowee-Toxaway Project, now being developed by Duke Power Company, will have a dynamic impact on the local economy. In this connection, the following excerpts are quoted from information furnished by Duke Power Company:

"Before the end of the 1970's, it is estimated that the Duke generating plants will employ some 170 persons, and other Duke employees working on related project activities will be about 40 in number, for a total Duke payroll of about 210 persons. In addition, forestry operations are expected to generate 200 jobs for woods-workers employed by private sawmill and timber operators. At least 40 additional jobs will be provided by lessees and operators of marinas and other recreational facilities. Thus, the initial phases of the project will create about 450 new jobs working directly in project-related activities. Applying the ratios developed by the United States Chamber of Commerce, we find that these 450 jobs will bring to the local economy:

\$3,000,000 in new personal income \$1,500,000 in new bank deposits 345 additional jobs in other fields \$1,800,000 in new retail sales per year Payment of mortgages or rent on 525 homes or apartments Ownership of 540 passenger cars

Ultimate employment on the fully developed \$700 million project, including Duke and non-Duke payrolls directly engaged in project activities, is estimated to be 2,000 persons."

"The recreational activities will stimulate local business and increase sales of goods and services normally incident to such activities, e.g., boats, gasoline, fishing equipment and supplies, residential building, etc.

The proximity of substantial amounts of water and power will enhance the industrial and commercial development of this area and facilitate economic growth. Construction activities incident to industrial, commercial, and residential development will provide temporary impetus to the local economy."

Paragraph III - Clinchfield Project

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One of the major purposes of this report is to point out the need and value of additional water storage facilities, for both water supply and water quality control, in South Carolina Appalachia. All future estimates, based on current water use data and the physical and economic characteristics of South Caroline Appalachia, point out dramatically the need for a large reservoir in the eastern portion of the six-county area. The Clinchfield Project near the head waters of the Broad River Basin, and just North of the North Carolina-South Carolina state line, now being studied by the Corps of Engineers, is a step in the right direction toward relieving future water supply and water quality problems before they occur.

This site has a capacity for storing an estimated 716,000 acre feet of water at the 810.5 foot elevation, msl, for present and future water supplies for nearby areas in North Carolina and for Cherokee, Spartanburg, and Greenville Counties in South Caroline Appalachia.

It is conceivable, and not beyond the realm of speculation, that water from the Clinchfield Reservoir will be a feasible source of supply needed for the economic growth of areas outside of, and adjacent to, the presently prescribed boundaries of South Caroline Appalachia.

The South Carolina Water Resources Committee has taken a firm stand favoring the development of this site to its maximum potential. The committee is submitting a statement at the public hearing on January 3, 1968, giving its official position favoring this project, and urging that all interested parties seek at an early date the approval and funding by the Congress for the development of Clinchfield Reservoir. (Copies of the committee's statement are available at the South Caroline Water Resources Committee, 1411 Barnwell Street, Columbia, South Carolina 29201.) The original design and construction costs should include elements of the intake and distribution systems needed for the fullutilization of the available water supply. The committee is hopeful that existing political boundaries will not be an obstacle to the realization of this important and essential water resource project so urgently needed for the future growth and development of this Appalachia area.

Paragraph IV - Small Watershed Projects

Section VIII, Paragraph II, discusses the status of small watershed projects in South Carolina Appalachia. The concentration of these projects with their numerous water storage structures for flood prevention, offer an opportunity for the storage of water for other uses related to future development. In Table 3, Section IX, Paragraph II, is a listing of small watershed projects showing the undeveloped storage capacities of completed and planned structures. In aggregate, these structures offer a potential for water storage for municipal, industrial and low flow augmentation which should not be overlooked.

These small watershed projects are locally sponsored projects with technical and financial assistance provided by the Federal government. Present policies require local financing for water storage for any purpose other than that needed for flood reduction. This is the main deterrent to the development of these sites to maximum storage potential. Due to the importance of these projects to the future development of water resources, it is recommended that the additional cost involved in using these numerous structure sites for maximum potential storage capacities be financed by the State, Federal, or local governments, private funds, or a combination of these sources. The costs to become reimbursable when the water stored becomes a saleable product.

Paragraph V - Recreation and Recreational Fishery Resources

The proposed 20,000-acre Clinchfield Reservoir project is located in the Broad River valley, approximately 5 miles north of Chesnee, South Carolina, just north of the North Carolina-South Carolina state line. The general terrain ranges from rolling to low hills characteristic of the foothills of the Blue Ridge Mountain Range. The 350 miles of shoreline with its many arms and coves will have a high potential for outdoor recreation development and use. The proposed project is presently accessible from all directions by good highways. The total participating population of the recreation market area of the Clinchfield Reservoir project is 595,000, the majority of whom reside within an hour's driving time of the project. Population and income increases are expected to follow developmental benchmarks with several cities outside the market area generating a significant amount of future outdoor recreation demand.

The estimated gross demand for four outdoor recreation activities in the recreation market area shows an increase from 5.3 million annual activity days in 1960 to 31.6 million in the year 2020. At present, there is a supply of over 16,000 acres of impounded water and more than 180,000 acres of land available for outdoor recreation within an hour's driving time of the project. These resources can support some 1.2 million activity days of the selected activities.

A comparison of demand and supply indicates a present and future need for boating, swimming, camping, and additional acres of land contiguous to and south of the park. This area is gently rolling, has several streams that lend themselves to impoundment, and consists of open space for golf courses, playfields, camping, etc. The area provides unexcelled views of the Table Rock Mountain Range, which cannot be ssen very well from within the park.

Recommended are two additional lakes to be built in the proposed new acquisition: (1) General Andrew Pickens, across which new Highway 11 (General Andrew Pickens Scenic Highway) would pass, and (2) Mill Creek, which would probably lie partly outside the area. These two lakes would provide excellent complements to picnicking, camping, golfing, and play areas.

Also within the area is the proposed Oolenoy Valley Golf Course which would be located near the present east entrance to the park.

Two satellite wayside parks are proposed: (1) "Old Gauldy" near the intersection of U.S. 178 and Highway 11, and (2) Weaver near the intersection of present S.C. 11 and S.C. 288. "Old Gauldy" would be provided with camping and picnicking facilities, two fishing-flood control lakes, and it would be a trail terminus from either Sassafras or Table Rock. This park might very well be partially developed and operated with private capital.

Weaver Wayside would initially provide only picnicking, boating, fishing and flood control.

Both of these areas would be under the operational jurisdiction of the Park Department.

Initiation of either project as a multi-purpose facility including flood control, would permit establishment of a watershed project in Oolenoy Valley under P.L. 566.

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It is strongly felt that Highway 11 should be designated a "State Parkway," maintained much the same as our national parkways, and be entitled General Andrew Pickens Appalachian Parkway or General Andrew Pickens State Parkway. The road could be serviced by the four state parks along its axis.

It is difficult to provide a better or more feasible method of insuring preservation of natural beauty along highways than by purchase or leasing of scenic easements. Such purchase or leasing is highly recommended for both S.C. Highway 11 and 288 from Holly Springs to Marietta and ahl of the new highway 11.

No formal outdoor recreation evaluation of this project has been undertaken at this writing. Certainly this proposal will contribute significantly to the recreation opportunities, and to the general aesthetic value and public appreciation of duth Carolina Appalachia. Future recreational fishery needs of Appalachia and the extent of future participation in sport fishing will depend on such factors as income, amount of leisure time, and availability of fishing opportunities. Incomes and leisure time have increased greatly in recent years and these trends are expected to continue.

The population of Appalachia is predicted to more than double within the next fifty years. During this same period, the number of fishermen will have quadrupled.

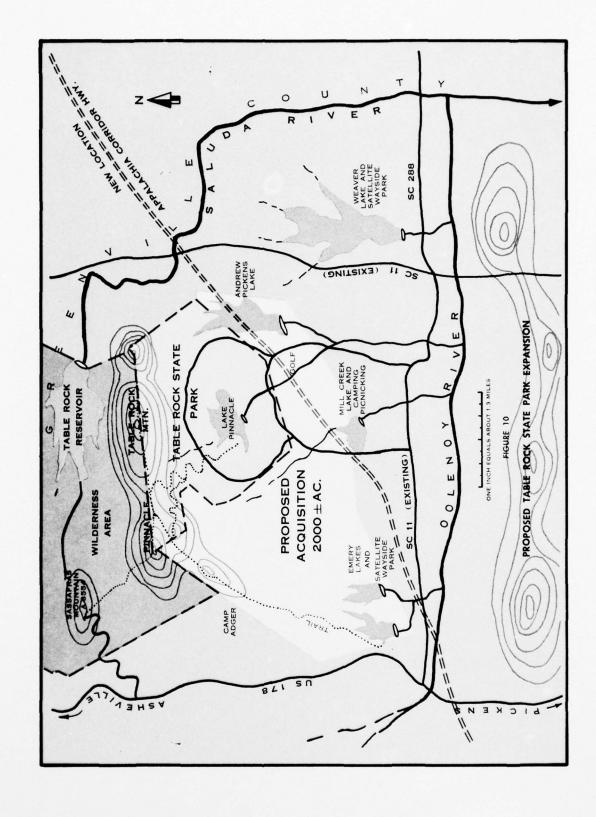
Projections for the year 2020 predict angling pressures to reach 1,785,000 fishermen trips. This represents a 300% increase over present levels of angling demand. However, through the application of fishery management techniques and the creation of an additional 39,000 acres of new impoundments, this tremendous increase in fishing needs can be fulfilled without a significant decrease in present levels of fishing success.

Even so, such optimistic predictions should not precipitate indifference on the part of the resource manager. The fulfillment of these projections hinge wholly upon the maintenance of the highest possible standards of water quality and do not make allowances for the use of these waters for any purpose which would lead to the destruction or deterioration of the resident fishery populations or the fishery they provide.

Table 10 lists projected future fishery resources and Table 11 projects fishery needs for population growth in South Carolina Appalachia, 1967-2020.

SECTION XI - FLOOD PLAIN STUDIES

The streams of South Carolina Appalchia are usually flanked by terrain that is relatively flat and smooth. These areas, called flood plains, often present serious problems when flood conditions exist.



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Table 10.- Status of future fishery resources in South Carolina Appalachia.

		1980			
Type Water	Total Acres	lt./ Acre	Total lbs	lt./ Trip	Fishermen Trips
STREAMS Cold Water Warm Water	460 2,100	57.0	26,300 43,200	.7 1.5	39,200 29,400
RESERVOIRS Public Private	63,000 7,600	23.0 52.0	1,450,200	1.5	966,800 396,600
TOTAL	73,160	26.2	1,916,300	1.3	1,432,000

		2000			
Type Water	Total Acres	lb./ Acre	Total lbs.	lb./ Trip	Fishermen Trips
STREAMS Cold Water Warm Water	426 2,000	75 23	32,000 46,000	.67 1.51	47,760 30,460
RESERVOIRS Public Private	72,000 10,896	30 70	2,160,000 762,720	1.49	1,449,660 762,720
TOTAL	85,322	35	3,000,072	1.31	2,290,600

		2020			
Type Water	Total Acres	lb./ Acre	Total lbs.	lt./ Trip	Fishermen Trips
STREAMS Cold Water Warm Water	39 <i>5</i> 1,800		40,000 45,000	.67 1.5	59,700 30,000
RESERVOIRS Public Private	73,500 12,200	35 75	2,572,500	1.2	2,143,800 915,000
TOTAL	87,895	41	3,572,500	1.1	3,147,800

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Table 11.- Projected population growth and sport fishery needs 1967-2020.

	1967	1980	2000	2020
Total Population	802,842	898,112	1,271,418	1,712,524
% Population that Fish	11%	14%	17%	20%
Total Fishermen	88,313	125,736	219,000	342,505
Trips per Fishermen	8.4	5.0	5.1	5.2
Total Fishermen Trips	388,114	000'869	1,126,000	1,785,000
Nominal Average 16. per trip	1.2	1.2	1.2	1.2
Perdicted total lbs. Harvested	453,305	837,600	1,351,200	2,142,000

The U.S. Army Corps of Engineers conducts flood plain information studies in areas where the use of these areas for urban development creates a vulnerable condition for intermittant flood damage. The studies consist of a survey and a report to the local community regarding the location, frequency, stage and duration of flooding. Flood frequencies of 50 to 100 years are evaluated. However, more frequent floods may also be included. These reports can be used by the community as a basis for planning and regulating the use and development of these flood plain areas.

The studies are made by the Corps of Engineers at no cost to the local people. The only obligation to the units of local government requesting the study is that they fully publicize the findings of the study.

Seventeen urban areas in South Carolina Appalachia have been designated by the Corps of Engineers as having existing flood plain problems. Of this seventeen, only two, Spartanburg and Greenville, are currently sheeduled for investigation by the Corps of Engineers District Office at Charleston. The Charleston District estimates that approximately five studies annually is the peak of their output for the Charleston District. The Corps of Engineers District Office in Savannah is responsible for flood plain studies in the portion of South Caroline Appalachia in the Savannah River Basin.

The South Carolina Water Resources Committee recognizing the need, importance, and value of these flood studies has urged that requests for the studies be processed through the South Carolina Water Resources Committee so that they may evaluate the requests, and establish priority on the basis of the merits and the urgency of the study.

SECTION XII - CONCLUSIONS AND RECOMMENDATIONS

Paragraph I - Conclusions

The South Carolina Water Resources Committee was assigned the responsibility for the preparation of this Supplement by Governor Robert E. McNair on October 18, 1967. With the short time available to meet the required deadline, and a new staff, the committee gave this assignment a high priority. It became quite evident, however, that due to insufficient time to adequately identify, analyze, and evaluate the available data, this would necessarily have to be an Interim Report. In spite of the fact that the report presents an abundance of information, data, and statistics on water resources in South Carolina Appalachia, the fact remains that more research is needed for dependable and realistic conclusions as to the status of some important phases of the water resources as related to the anticipated growth and development of the area.

In regard to <u>water quantity</u>, the western section of the six-county area (Oconee, Anderson, and Pickens Counties) is in a strategic position to utilize the available water in the completed Hartwell Reservoir and the

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Keowee-Toxaway Reservoirs now under construction by Duke Power Company. Water from both of these projects has been declared as being available for public and industrial use, and these sources of supply will be adequate for the projected economic growth of the western section of South Carolina Appalachia if adequate distribution and treatment facilities can be financed and installed. Other sources of water are available in this area, as is the case in the eastern section from full utilization of sites in the small watershed projects for water storage, stream flows, and ground water. The latter two, however, cannot be adequately evaluated without additional study and research.

The eastern section of South Carolina Appalachia (Greenville, Spartanburg, and Cherokee Counties) are not as fortunate as their western neighbors in regard to available water. Although Greenville County may look to Duke Power Company's Keowee-Toxaway Project as a possible source of water, this has not been established as the most feasible and economic route for this county to take to meet its future water requirements.

Spartanburg County has no immediate problem with the adequacy of its source of water to meet its present needs. However, on the basis of its projected growth and development Spartanburg County has reason to be looking for an additional source of water to serve its future needs.

Cherokee County, although not developing as rapidly as Spartanburg and Greenville Counties, needs only an immediate assurance of additional water resources to realize its full potential for future growth and development.

In addition to the available water resources from local stream flows and ground water (the extent of which is unknown, and should be the subject of a comprehensive study) with the potential storage capacities of structure sites in the small watershed projects, the eastern section of South Carolina Appalachia is eagerly anticipating a favorable report on the proposed Clinchfield Project, now being studied by the Corps of Engineers, on Broad River at the North Caroline state line. This project, with its potential for water supply storage, typifies the entire philosophy of water resource development for economic growth. The Clinchfield site, with its strategic location, will assure an ample and sustained supply of water for municipal, industrial, urban, and rural development in a large section of Appalachia in both South Carolina and North Carolina.

Portions of Sections VI and IX, and Figures 3, 4, and 5 summarize present status and activities for water quality control in South Carolina Appalachia. The South Carolina Pollution Control Authority and the United States Geological Survey are the two agencies from which data was obtained and included in this report.

Considerable progress has been made in improving the quality of the major streams in the Couth Carolina Appalachian Area. Many problems still exist, however, before all waters in the area will be in complete compliance with the State's Water Quality Standards. The rapid influx of industry in some areas, and the accelerated conversion from a rural to an urban

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environment is, in many cases, exceeding the capacities of existing waste treatment facilities, and resulting in an effluent below the originally planned standard. Figure 4 is an attempt to visually emphasize the concentration of waste effluents on the streams in South Carolina Appalachia. Treatment of these effluents vary from no treatment to primary treatment. No attempt was made to identify this feature. However, Figure 5 identifies the quality classifications of the streams receiving these effluents.

In connection with Pollution Control the following is quoted from the 1967-68 State Development Plan for South Carolina Appalachia: "An estimated 75 percent of all new housing built in the county (Greenville) is served by septic tanks rather than sanitary sewerage." This condition prevails in varied degrees of intensity throughout the six-county area, and presents serious pollution problems both from the standpoint of surface water and ground water.

All aspects of water quality control, present and future, should be thoroughly researched in order to guide the planners in the development of South Carolina Appalachia in an environment of high quality water. It should be noted that very little information is available on the sediment transport characteristics of the streams in Appalachia, and this is a serious pollutant problem in the area.

Water for low flow augmentation and other quality control purposes is an important aspect of water resource planning, and must not be omitted from long-range plans. Low flow augmentation, however, should never be accepted as a substitute for an acceptable waste treatment facility.

The full potential of Appalachia will be realized only through the development of carefully coordinated plans for use and management of all available water resources. The overall objective is to attain the maximum possible contribution from the water resources toward the present and future development of South Carolina Appalachia.

Paragraph II - Recommendations

<u>Water Quality Study</u>. Much has been accomplished in South Carolina Appalachia in pollution control, but there are still many problems in this field. These problems are expected to develop more rapidly with the projected growth of the area. Figure 4 of the report shows the approximate location of the many effluents presently discharging wastes into the streams of the area. These effluents are not identified as to quantity and quality. A comprehensive study of water quality by Basins and Sub-Basins is needed to include:

- (1) Identify each effluent as to source, type of pollutant, type of treatment received and quantity.
- (2) Stream sampling procedures to establish existing water quality as classified by South Carolina Water Pollution Control Authority.

- (3) Correlate (a) and (b) to determine the quality control program to bring stream classification to acceptable level.
- (4) Make a realistic projection on needed pollution control measures such as additional treatment facilities consistent with projected growth.
- (5) Evaluate the feasibility, economical and physical, of combining effluents which are common to the same stream and in close proximity into one treatment facility when the treatment requires upgrading.

Therefore, it is recommended that a water quality study be funded and initiated to determine the present status of and future needs for waste treatment facilities in South Carolina Appalachia.

It is further recommended that a more intensive application of the Water Pollution Control Act of 1965 be promptly initiated in order to alleviate some of the existing pollution problems discussed in Section VI.

Stream Flow Study. Section VI of this report summarizes the activities to date of the United States Geological Survey in connection with stream flows in South Carolina Appalachia. Figure 2 shows the intensity of the stream flow gaging presently in operation and tabulates the data accumulated during the period of record. It is generally believed that throughout the area stream flow yields are adequate for substantial water resource developments. However, low flow is a critical consideration in evaluating this potential, and, as indicated in Section VI, low flow records are not available in sufficient detail anywhere in the area except in Spartanburg County. In addition, a more intensive gaging program is needed throughout the area to permit more accurate prediction of floods and flood stages as related to rainfall intensities and durations.

The accumulation of hydrologic data is not a shortterm activity. As a matter of fact, the longer the duration of the study, the more accurate the record.

Therefore, a cooperative program with the United States Geological Survey is recommended to establish and operate a more intensive stream gaging program in South Carolina Appalachia that will expand on data already collected to the end that planners for future water resource development will have at their finger tips reliable information on which to base decisions.

It is further recommended that this data collection activity be programmed in such a way that, in due time, the advantages of a digital computer may be utilized in storing, projecting, and forecasting data.

Ground-Water Study. This report raises a question regarding the adequacy of ground water supplies in South Carolina Appalachia as a potential. Nevertheless, ground water is the central water supply for many residential areas already in existence, and being planned, in the conversion from a rural to an urban environment. In addition, ground water is the main

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source of supply for a number of industrial plants with low water requirements. There are two significant factors which need further study in order to establish a reliable basis on which to plan for the use of ground water as a dependable source of water:

- (1) Research to permit a prediction of the quantity of water at a specific location under extreme climatic conditions and within a specified pumping area; and
- (2) determine the limit of concentration of untreated waste disposal which can be tolerated without ground-water pollution exceeding accepted limits.

Therefore, it is recommended that a comprehensive study of both quantity and quality of ground-water in South Carolina Appalachia be initiated to include, but not limited to, the following:

- (1) An inventory of significant existing wells to include:
 - (a) Drillers logs.
 - (b) Geophysical logs where practical.
- (c) Water analysis to reflect both physical and chemical characteristics.
- (d) Pumping tests on single wells and groups of wells in order to determine aquifer characteristics.
- (2) Establish a network of observation wells with continuous recorders to determine seasonal and climatic affects on water levels.

It is further recommended that the South Carolina Pollution Control Authority establish and enforce a regulation requiring a sanitary sewage disposal system for present and future densely populated areas.

Utilizing Maximum Storage Potential, Small Watershed Projects. Table 3 provides revealing data in regard to water storage potentials at structure sites in small watershed projects. Completed sites not developed to their maximum storage potential are nothing less than missed opportunities for water resource development. Planning for future sites without utilizing the maximum storage potential is contrary to the sound principle of developing the area's water resources for economic growth. Financing the additional cost involved in providing maximum storage appears to be the major obstacle.

It is recommended that structure sites in the small watershed projects be developed for maximum storage of water for designated useful purposes. It is further recommended that funds needed, over and above those provided by the Federal Government, come from a public or private source; such funds to become reimburseable when the water becomes a saleable asset.

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Silt and Sedimentation Site and Source Studies. One of the great contributors to stream pollution is the erosion of land. For more than 30 years the work of the Soil Conservation Service, the South Carolina Forestry Commission, the U.S. Forest Service and other public agencies having natural resource related responsibilities have given dynamic emphasis to erosion control on rural lands.

Within the past few years, the S.C. Highway Department has accelerated a program of roadside stabilization.

The rural landowners, through the Soil and Water Conservation District Programs have dynamically changed the methods of operations and of land use to help stabilize the soils under their control.

Yet, there are still too many untreated sources of silt and sediment entering our lakes, streams, and water courses all contributing to high treatment costs and lower quality for domestic recreation or wildlife use.

This report points to the fact that sediment transported in the streams is a serious pollution problem, but few silt sources have been identified. In fact, there is no such information available by the site and source identity for the area studied. It is believed that some silt sources aggravating pollution problems stem from mining wastes, untreated roadbanks, especially secondary roads, and unpaved or treated rural roads or trails. Another source is most likely where the ground is altered for the beginning of construction. Such areas left open and untreated for any length of time are serious hazards during peak rainfall runoff.

It is recommended that (1) a comprehensive monitoring program be established to determine the sediment characteristics of significant streams in the area, and (2) a site and source study be made of silt and sediment sources of the area with accompanying recommendations for abatement.

Consumption - Treatment - Cost Relationships. This report points to situations where problems of long standing exist wherein sub-divisions of State government and private groups move first and independently to develop water supplies for domestic consumption. Later, and not paralleling the advent of supplies, waste disposal has historically taken second or no place at all in the overall system.

At this point in time, it seems imperative that water systems must be completely designed, funded, and constructed simultaneously; thereby moving to fill the responsibility in the public interest, to take water from its source, route it through a complete system, including waste disposal and treatment, and within reason return it to its point of effluent unimpaired in quality and undiminished in quantity.

Most of the public and private entities purveying water in small and large cities have available to them consumption treatment cost relationships, with alternatives and variables within the area studied and included in this report.

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Water Rights. Current studies which point to increasing investments in water supplies, use, distribution, and treatment in South Carolina Appalachia lead to several legal implications.

If in theory the Riparian Doctrine of Water Law is interpreted and adhered to the letter of the law, there seems to be a growing possibility of conflicts in interest between riparian owners wherein one may adversely affect another by returning water to its original course impaired in quality or diminished in quantity. Such a philosophy, in fact, supports a non-use theory. In a dynamic, growing society, certain restraints are imposed or implied. These restraints could be hazardous where economic growth is nighly desirable.

For example, this study points up a future need for transporting water from one watershed, sub-river basin or river basin to another. Currently, there is no statutory authority to do so. Further, it is doubtful that such investment could be held secure without first making the investment, then later, if damage is claimed, have the test made in Court.

Therefore, it is recommended that the State of South Carolina continue its studies of water rights and develop and adopt a code that will relieve the foreseeable conflicts amont would be users prior to investment.

Other Recommendations.

- 1. Develop the proposed Clinchfield Project on Broad River at the South Carolina-North Carolina State Line to its maximum storage potential for water supplies, and include in the design and construction costs the elements of a distribution system.
- 2. A study of the recreation potential of the proposed improvement of Table Rock State Park in Pickens County by the Bureau of Outdoor Recreation.
- 3. Schedule and complete flood plain area studies at selected locations where there is a flooding hazard to area development.

The recommendations in this section are those deemed most urgent at this time. As additional studies are completed, and more information becomes available to the State Water Resources Committee, additional recommendations will be forthcoming as needed to fully develop an environment of a plentiful supply of good quality water for all purposes.

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ACKNOWLEDGEMENTS

The State of South Carolina Water Resources Committee wishes to express its appreciation for the generous assistance and cooperation of State, Federal, and local agencies of government for furnishing much of the basic data included in this report. Special appreciation is extended to Messrs. John S. Stallings, District Chief; George E. Siple, Associate District Chief; T. Ray Cummings, Chemist; W. M. Bloxham, Hydraulic Engineer; and J.W. George, Hydraulic Engineering Aide; all of the U.S. Geological Survey, Water Resources Division. To Messrs. John Smith, Engineer, South Carolina Pollution Control Authority; Hugh J. Dowdle, Assistant State Conservationist; and James M. Kesecker, Planning Staff Leader, Soil Conservation Service. To Messrs. Joe H. Watson, Field Coordinator, South Carolina Parks, Recreation and Tourism; Donald Archer, Fishery Biologist, South Carolina Wildlife Resources Commission; Ed Lattimer, Assistant Attorney General, South Carolina Attorney General's Office; Richard J. Bodamer, Planning Coordinator, Appalachian Advisory Commission; William A. McInnis, State Planner, State Division of Planning and Grants; John L. Mack, Chief, Community Services, Farmers Home Administration; and Dr. J.M. Stepp and his staff, Agricultural Economics Department, Clemson University.

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 11
TENNESSEE WATER SUPPLEMENT

Prepared by
The Tennessee State Planning Commission

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V STATE WATER SUPPLEMENTS

CHAPTER 11 TENNESSEE WATER SUPPLEMENT

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SECTION I - INTRODUCTION

The Appalachian area of Tennessee is a 50 county region apart geographically and statistically; a highland region and a mountain land boldly upthrust between the prosperous Eastern seaboard area of the United States and the Middle West.

This area of the state has natural advantages which might normally have been the base for a thriving industrial and commercial complex. Tennessee Appalachia has been endowed with some of the nation's richest mineral deposits beneath its surface. The region receives an annual rainfall substantially above the national average. More than three-fifths of the land is forested. Its mountains offer some of the most beautiful landscapes in America, readily lending themselves to tourism and recreation.

However, this natural endowment has not substantially benefited the people of this region. The average Tennessee Appalachian has not matched his counter part in some other sections of the State and most significantly has fallen far short of obtaining the economic goals of the nation as a whole.

In this large region of the state there is a range of productive activity and social achievement between subregions that belies the general statistics of the geographic whole. Where rivers converge, where the valleys open, or where transportation routes are accessible, some cities and towns have prospered. Income and living standards for some of these growth centers have equalled or surpassed the state and national average. It is obvious that the problems of the rural interior counties of Tennessee Appalachia cannot be equated with those of the larger cities and towns of the region.

It is significant that many of the more prosperous cities and towns of the region do not measure up to the performance of urban areas in the rest of the nation. They continue to reflect the hard core underdevelopment of Appalachia.

Purpose of This Report - It is the belief of this agency that the development of natural resources of the Appalachian Region of Tennessee can be a prime factor in the alleviation of the substandard economic and social conditions of this large section of the state. This report will be concerned with the development of water resources in Tennessee Appalachia. Many technical books and periodicals have been published regarding the subject of water resources in this region. This study is not intended to equate the large amount of technical information available on water resources in Appalachia. It is presented as a general guide in regard to state needs, policies, procedure and developmental goals for water resource development in the Appalachian Region. Some of the subject matter to be discussed in this report will include water recreation, flood

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control, stream pollution, existing water supplies, water availability and uses and population changes affecting water resources in this area.

SECTION II - WATER RESOURCE DEVELOPMENT RECREATION 1/

Tennessee's Interim Outdoor Recreation Plan, completed in February, 1966, places major emphasis upon the need to upgrade state facilities as the key to meeting the recreation needs as identified in the plan. The plan identified outdoor recreation needs by landscape regions within the State. Visitation figures were presented for 1964 also by landscape region. Demand projections were made for the three Grand Divisions of the State and for the State as a whole. Tennessee Valley Authority and the U.S. Army Corps of Engineers reservoir and dam visitations were major factors in measuring the outdoor recreation demand.

It was envisioned in the state plan that the upgrading of State out-door recreation facilities would be carried out in conjunction with Federal agency investments. This is especially true of water impoundments, since the State of Tennessee is not in the business of building dams and creating large water impoundments. Objective No. 5 of the Action Program (page 231) makes a specific reference to the fact that the State will take advantage of major federal projects including reservoirs.

The plan specifically mentions the need for Panther Creek State Park of some 1,300 acres at TVA's Cherokee Reservoir. Additional land was to be acquired at Cove Lake and Big Ridge State Parks on Norris Lake. In all some 8,800 acres will be needed by 1970 for park expansion in East Tennessee just to maintain the 1964 level of intensity. The addition of new parks in East Tennessee needs to be given special attention. The plan calls for expansion of park facilities at Cove Lake, Harrison Bay, B. T. Washington, Norris Dam, Big Ridge and Warriors Path State Parks. The only concrete example of the preservation of hunting and fishing in the plan was the mention of the possible combined effort with the Game and Fish Commission in the development of selected areas. Master planning has been completed for some reservoir park possibilities. Negotiations have been underway with both the TVA and U.S. Army Corps of Engineers regarding state park sites as new or proposed impoundments.

As many as 15 reservoir sites in the Tennessee Appalachian region were identified in the plan as having some potential for outdoor recreation development (pages 167 and 168). Obviously some of the sites have greater potential than others. Master plan reports have been completed

1/Source: Tennessee Department of Conservation

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for three (3) sites. Estimated average costs of both land and developments are about \$3,000,000 per park. It is felt that this figure will be on the conservative side by the time actual construction gets underway. Even though many of the potential reservoir sites may not lend themselves to major park developments, pressures continue to mount for additional outdoor recreation benefits for new reservoir construction projects, the partial solution of the region's economic ills, and finally, providing a park for the citizens of Tennessee as well as tourists coming from outside the state.

The state plan does recognize the possible economic impact of selected scenic river developments with outdoor recreation value within the Appalachian region and recommends evaluation of alternatives by appropriate federal and state agencies.

In spite of expanded efforts by the State of Tennessee to obtain additional funds for State Park developments, the availability of State Park funds is running considerably behind federal expenditures for major dams and reservoirs in Tennessee, seemingly widening the already existing gap. In summation, Tennessee is blessed with water resources and major water impoundments with more in the making. The state will make every effort to work with all Federal agencies in providing park facilities on major reservoirs, as funds permit, and we welcome the opportunity to do so. In order that the magnitude of expenditures be emphasized, let us assume that all the fifteen reservoir sites had state park potential. This could mean an investment of some 50 to 75 million dollars as a minimum expenditure. This would be a ten-year state park program, or longer at the present level of expenditure for only one-half of the state. For the entire state a 100 to 150 million dollar investment program could be envisioned. The maintenance of existing parks can be added to these estimates.

Unless some additional funds become available for state park developments, we will continue, at least in the near future, to fall short of the number of opportunities presented at major reservoir sites.

SECTION III - WATER RESOURCES RECREATION - SPORT FISHING2/

In terms of the fisheries resource, Tennessee has over 500,000 acres of impounded waters (mostly in the form of reservoirs) with more in the planning stage, and approximately 16,000 miles of streams. Most of these waters contain a conglomerate of fish species, both game and rough with standing crops of from 50 to 300 pounds per acre.

Sport fishing is important both from the recreational and economic standpoints. In 1961 there were over 7.5 million fishing trips which accounted for an expenditure of \$29,914,000 in the State of Tennessee.

2/Source: Tennessee State Game and Fish Commission
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If the 2.7 per cent average annual increase in fresh water anglers is comparable to Tennessee, the figures would be approximately 8.9 million fishermen days in 1967, 9.6 million in 1970 and 11 million by 1975.

Since the streams and reservoirs provide a certain amount of fishing naturally, providing access to these areas may be all that is needed on some waters for the present. In areas where few fishing waters exist the construction of a state lake may be desirable.

It is reasonable to assume that a large portion of the expected increase in fishing effort will be directed at public owned streams (primarily reservoirs). If this is true, more knowledge will be required and better arrangement techniques will have to be developed on these waters.

Increasing demand for adequate fishing facilities by sportsmen will decide the criteria in the future. The increase in population, shorter work week, more time for recreation, earlier retirement, etc., will all be factors in increasing the demand for recreational water development.

To meet the requirements of expected increases in sport fishing effort at a satisfactory level of catch, adequate waters must be provided for over 9.6 million fishermen-days and provide a catch of approximately 20 million fish (10 million pounds) by 1970.

Some of the state's problems and goals to insure that adequate waters are available to the public are as follows:

- (1) Insure that at least 500,000 acres of water will remain open to public fishing;
- (2) Maintain water quality at its present level, at least;
- (3) Provide adequate public access;

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- (4) Resolve problems of other water uses that may conflict with fishing activities;
- (5) Investigate means of increasing or facilitating harvest of selected fish species in impounded waters;
- (6) Investigate means of improving production of desirable species in both streams and impoundments;
- (7) If present trends continue, the state might have to become more involved in land acquisition, particularly where it applies to stream access. As the number of miles of free flowing streams decrease and fishing pressures increase, it will be necessary to intensify management of warm water streams and supplement present cold water management with barrier and increased hatchery facilities.

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More consideration should be given to long term lease or outright purchase of strips of land along the selected streams of high fishing and aesthetic appeal.

SECTION IV - LOCAL WATER SUPPLY SYSTEMS AND SEWAGE TREATMENT PLANTS AND FLOOD CONTROL

Tennessee has the goal in its Appalachian Region to develop a permanent capacity for self-sustaining growths and to gain an employment and economic base comparable to the nation of which it is a part.

In the striving to reach the stated goal, Tennessee's objective is to assure that public investments such as water and sewage facilities, are best calculated so that they will most effectively promote the competitive advantage of the region and that the expected return on public dollars invested will be the greatest. The state plan for allocating resources has been based upon the growth potential of such regions within the Appalachian Region, and within subregions the growth potential of individual urban areas.

The development of public water and sewer facilities in the urban growth centers of the region has played a vital role in the acquisition of new industry and the expansion of existing industry. This development has created more jobs and raised the economic base of these areas.

In all of the five subregions of the Appalachian area as contained in The Tennessee Appalachian Development Plan the most prevalent problem preventing growth is the inadequacy of water and sewage facilities in the urban centers. The subregions and each city within these regions of Appalachia has its own type of water problem varying in the form of water supply, quality, quantity and distribution. Many improvements have been made in the water and sewer systems of the Appalachian Urban Centers. The inception of the Appalachian Regional Act and the joint participation of the Appalachian Regional Commission, other Federal agencies, the state and local interests have brought many of the facilities up to present day needs. Future growth for these urban centers will depend on adequate expansion of these facilities to accommodate growing population trends and expanding industry. Continued efforts by Federal, state and local agencies will be necessary to maintain satisfactory economic levels and provide for future growth in these areas.

Many of the smaller towns in Appalachia are without adequate funds to finance large public facility projects. Many of these towns are not capable of raising sufficient funds on a matching percentage basis with Federal agencies. The development of water and sewage districts including these small communities may be a partial solution to this problem. The larger urban growth centers could serve some of these areas with expansion of existing facilities.

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Flood problems continue to exist in some areas of Appalachia causing extensive crop damage and property destruction. The areas of Elizabethton (Carter County); Erwin (Unicoi County); Alcoa (Blount County); and, Athens (McMinn County) have severe flood conditions during certain times of the year. Solutions to these problems are different for each area. The construction of reservoirs, dams, water impoundment and the improvement of stream channels can alleviate these conditions in many of the problem areas. The joint cooperation of Federal, state and local agencies must be continued if these conditions are to be eliminated.

Continued growth in these areas will necessitate additional expenditures. The Tennessee Valley Authority, the Army Corps of Engineers, the U.S. Department of Agriculture and other Federal agencies are currently conducting investigations with regard to a number of these problems including local flood problems at or near Athens and Cleveland, Tennessee.

The Cumberland River developed by the U.S. Army Corps of Engineers is being brought under control by a series of well planned multi-purpose dams on the main river and its tributaries. This will provide additional flood control for the Cumberland and Mississippi Rivers. The possibilities follow that the counties and cities surrounding the Cumberland in Appalachia will share in the three essential categories of benefits; flood control, economic and industrial development, and transportation.

Isolation or the lack of access has always been an economic problem facing the Appalachian section of Tennessee. There is a need for opening up East-West routes of transportation. The development of the Cumberland River will help provide this link as a supplement to Interstate and Appalachian Corridor Highways.

SECTION V - DEVELOPMENTAL STRATEGY

The Developmental Strategy of Water resources by the State is a policy of continued investment and cooperation with appropriate Federal agencies to obtain the highest return for public dollars invested.

Water Resource development of the state has evolved into a very close working relationship with Federal, state and local agencies and should continue to follow this course.

Each region of Appalachia has its own specific water problem such as flooding, water quality, pollution, distribution, etc. But these problems transcend city, county and regional lines. Pollution problems upstream can drastically affect water quality downstream. Flood conditions that exist in a small local area have detrimental effects on the silt quantities in streams below the source of the actual flood. Cities, communities, counties and regions discover that the problem of one is the

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problem of all. Regionalization and districting of areas whereby joint cooperation is obtained to solve these problems may be necessary. Regional water demand is greatest in the Tri-Cities, Chattanooga, and Knox-ville Regions, respectively. Greater population and industrialization in the Lower and Upper Cumberland Regions would mean increased demand there. However the greater demand will probably remain with the other Regions, at least in the near future. Although adequate data is not available on supply and demand for the region, all indicators point to an adequate supply of water. The problem will be the conflict over water use and the danger of water pollution.

Developmental Benchmarks projected to the years 1980, 2000, and 2020 show an increase in population and employment for most of the Appalachian subregions. The urban growth centers of the area will continue to serve as the economic nucleus of the perspective regions. This will increase the demand for goods and services and adequate water facilities to accommodate this growth. Population and employment figures can be projected for decades into the future but the intensity or concentration and distribution of the population is greatly affected by many non-economic factors such as the social and political components of an area.

Growth centers can only continue to be growth centers as long as they satisfy all the basic needs of the people, social, cultural, economic and political. Some speculation must be considered when projections are based on Developmental Benchmarks that future trends will continue as established by present conditions. Without exception, water development strategy must take this into consideration, for long range planning.

SECTION VI - WATER RESOURCE DEVELOPMENTAL NEEDS

Water Resource Developmental needs in Appalachia are essentially problems of water quantity, quality, flood control and distribution. The biggest problem and the one that seems most common to all areas and subregions is the inadequacy of water and sewerage facilities. This causes an economic dilemma of major proportions such as the lack of industrial development, fewer job opportunities, high unemployment rates, out-migration of the population, etc.

The Appalachian Region of Tennessee has been divided into five subregions and some specific needs for Water Resource Development can be shown for each region.

1. The Upper East Tennessee Region - 8 Counties. The most notable problems affecting this Region are lack of resident employment, poor water distribution and inadequate sewage disposal facilities.

Water and/or sewer problems exist in several cities in this Region; Bristol, Johnson City, and Elizabethton.

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- 2. The East Tennessee Region 16 Counties. This Region is characterized by a diversified economy with manufacturing being the single largest employer. The most pressing needs of the Region are extension of water and sewer facilities. The cities of Oak Ridge, Maryville, Harriman, Clinton, Loudon and Rockwood have water and/or sewerage problems. Some of these cities need additions to existing facilities or the construction of new facilities.
- 3. The Southeast Tennessee Region 9 Counties. This Region is characterized by economic diversification. Manufacturing was by far the largest single employer. This Region, much like the East Tennessee has problems associated with both a large urban area and its hinterland. Thirteen communities were surveyed in the Region and the most often observed problems were inadequate water and sewer systems, lack of vocational schools, health facilities and too few industrial sites. Cities experiencing water and/or sewerage problems include South Pittsburgh and Dunlap. There is a flooding problem in the City of Athens by Oostanaula Creek in the downtown area at certain times of the year.
- 4. The Upper Cumberland Region 11 Counties. The Upper Cumberland Region has been notably a region cut off from other industrial areas of East Tennessee because of an abrupt escarpment included in the Cumberland Plateau. Thus, for the most part this region has remained dominated by an agricultural economy. The output of agricultural and manufacturing comprises the more important economic functions of this region. Eleven communities were surveyed in the Region and inadequate water and sewerage systems were the predominating problems in the area. The cities of Cookeville, Crossville, and Gainesboro have water and/or sewer problems. Although the city of Cookeville is growing, its public facility base is not growing as rapidly and the problems of servicing its population will probably increase in the next few years.
- 5. The Lower Cumberland Region 5 Counties. The economic profile of the Lower Cumberland Region shows concentration and orientation toward manufacturing, agricultural trades and services and in newer forms of extractive industries. Although the urban population of this Region is increasing, the region is still highly rural. There is no urban core to the Region and therefore no concentration of urban services. One of the primary needs for this region include water and sewerage improvements for most of the communities. The City of Manchester is in the process of completing a half million dollar addition to the present sewerage system. The City of McMinnville is expanding its sewerage treatment plant which is not adequate to serve the present population. The City of Winchester is in the process of moving its sewage treatment plant because of the backwaters of the Tims Ford Dam and Reservoir. These plans also include a new filtration plant that will increase the capacity of sewage treatment.

The basic Water Resource Developmental needs as briefly described for the five subregions of Appalachia has concentrated on water and sewerage needs for the cities and towns in these areas. Extensive programs

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are in the working and planning stages by the U.S. Department of Agriculture regarding soil conservation and flood control.

Flood plain studies such as those conducted by SCS, TVA and Corps of Engineers provide Appalachian communities with useful information concerning local flood problems.

Several other types of flood control measures are currently in use throughout the region. These should be encouraged, particularly where the need for flood protection would not appear to justify the cost of major structural measures. These include subdivision regulation, zoning, building ordinances, and channel encroachment restrictions. Many communities in Tennessee have adopted flood plain regulations, for example, Anderson County has zoned the land along the Clinch River and its tributaries and also the shores of Melton Hill Reservoir.

Several large projects in the Appalachia area have been completed by the Soil Conservation Service. One example is the Proctor Creek Watershed and Clay County Soil Conservation District in Clay County, Tennessee, which was completed in 1966. Over 8,000 acres of farm land were improved by this project at a total cost of \$135,064 (\$90,049), P.L. 566 and \$45,015 other sources. The principal problems involved in this project were flood water and sediment damage to agricultural lands, crops, roads, bridges, fences and farm buildings. Since the completion of the project by channel improvement there has been no flooding of flood plain land. Roads and bridges have not been damaged due to flooding.

Other projects in the planning or completion stages by the Soil Conservation Service include more than a dozen counties in the Appalachian area.

There is a continued need for this type of water development program in Appalachia and the state program is one of endorsement, cooperation and fulfillment with TVA, the Corps of Engineers and all appropriate Federal agencies concerned with Water Resources Development.

The most prevalent water resources development needs in Tennessee are:

- (1) Flood protection and water supply at Jellico in Campbell County (along Elk and Clear Creeks);
- (2) Little Pigeon River at Gatlinburg and Pigeon Forge; Pigeon River at Newport;
- (3) Elizabethton, Johnson City, Kingsport, Knoxville, Chattanooga, Briceville, Rockwood, Sweetwater, Olive Springs, LaFollette, Townsend, Maryville, Alcoa, Oak Ridge and Loudon; and
- (4) Rural flood protection along most of the streams which cause urban flooding listed above as well as most other streams in the state.

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There are other smaller watersheds in several water districts in Appalachia that have not requested assistance from the Soil Conservation Service which merit investigation.

The following are suggested:

- (1) Flooding on Beaver Creek and Hinds Creek in Knox and Anderson Counties is detrimental to the communities of Andersonville and Powell and agricultural development.
- (2) Poplar Creek in Anderson and Roane Counties and its branches cause flooding conditions in Oak Ridge as well as in closely developed areas near Oak Ridge and Oliver Springs.
- (3) Baker Creek flooding affects the small community of Jena as well as agricultural lands and potential industrial lands in Blount County. This creek as well as 9 Mile Creek which affects agricultural lands, needs study for potential flood reduction.

In brief, the greatest demand for water will continue to be for industrial purposes although population growth, in particular, urbanization will put increasing pressure on the total water resources. Even though sufficient data is not available for complete analysis, there is little doubt irrigation and rural water demands will bring much pressure on the total water resource. In spite of the total demand for water in the region there seems to be little concern for water shortages.

Conflicting water uses within the region, such as water for recreation, industry, municipal and waste disposal, and the best use of reservoir shore lands are a major concern. 3/ The state is in need of a water policy that will remove the uncertainties and conflicts of some legal problems without damage to the interests of others.

SECTION VII - STATE PROGRAMS TO FILL WATER RESOURCE NEEDS

Programs have been enacted by the State of Tennessee in the fulfillment of water resource needs. One outstanding example is the recent legislation controlling destructive strip mining practices in Appalachia that was producing high acid pollution in some of the streams in this area. More rigid controls and water quality standards have been defined. Public awareness of water problems and needs has been made evident through communicative media such as television, radio and newspapers. There is need for a well-rounded program of hydrological research which meets current and

^{3/}Resource Inventory and Analysis of Tennessee Appalachia, Tennessee State Planning Commission, June, 1967.

future needs of the general public and which at the same time provides specific items of information for technical agencies and the need for interpretation of large amounts of records.

Water is a natural resource that can be polluted, wasted and improperly managed. Probably one of the most important aspects of a state program or plan is awareness by all users of our water supplies that there must be a joint and cooperative arrangement to conserve this precious commodity. It is a responsibility that all citizens must meet.

The water resources of Appalachia have not been developed to the fullest. Water distribution, contamination and mismanagement still present severe problems to the area. Water is one of the natural elements of which this region has been endowed and can become a prime factor in alleviating causes of economic blight and deterioration.

In a statewide context, the Office of Urban and Federal Affairs has negotiated a grant from the Water Resources Council for a water and related land use study in Tennessee. This study, just underway, will be administered by the Tennessee State Planning Commission in cooperation with all interested agencies including the Department of Conservation and its State Parks Division, the State Water Engineer, the onservation Planning Office concerned with the State Plan for Outdoor Recreation, and the Division of Forestry and Geology; the Tennessee Game and Fish Commission; the State Department of Public Health, its Division of Sanitary Engineering, and the State Stream Pollution Control Board, the Water Research Office at the University of Tennessee; and the State Soil Conservation Service Committee.

The state plan for water resource development in Appalachia must continue to be one of participation and cooperation by appropriate Federal, state and local agencies.

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 12 VIRGINIA WATER SUPPLEMENT

Prepared by
Department of Conservation and Economic Development
Virginia Division of Water Resources

The Committee of the Co

Virginia's Development Strategy: Appalachian Region

Fiscal Year 1968

PREFACE

The Virginia Appalachian Development Plan for the fiscal year, 1968, was prepared in compliance with Resolutions 96, 115 and 136 of the Appalachian Regional Commission.

It was prepared by the Virginia Division of Industrial Development with the cooperation and assistance of the Appalachian Regional Commission, the State departments of Agriculture and Commerce, Community Colleges, Conservation and Economic Development, Education, Health, Highways, Labor and Industry, and Taxation; the State Air Pollution Control Board, Employment Commission, Library, Board of Examination of Nurses, Commission of Outdoor Recreation, Division of Planning and Water Control Board; and the Lenowisco Planning and Economic Development Commission.

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V STATE WATER SUPPLEMENTS

CHAPTER 12 VIRGINIA WATER SUPPLEMENT

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I. INTRODUCTION

History of the Act

The President's Appalachian Regional Commission was formed on April 9, 1963, to prepare a comprehensive development program for the Appalachian Region as requested by President John F. Kennedy. In 1965, the Commission reported on the economic condition of Appalachia and presented a broad program for improvements to be made in the Appalachian Region. It was recommended that an Appalachian Regional Commission be established to carry out the program.

The final recommendations of the Administration and the Public Works Committees included a new Section 206. This section provided for a thorough survey of Appalachia's water resources to be made to include consideration and study of every facet of water resource development.

The Appalachian Regional Development Act of 1965 became law on March 9, 1965. It provided for an Appalachian Region containing parts of 10 states and all of West Virginia. The program gives special attention to the need for an increase in the production of economic goods and services within the Appalachian Region as a means of expanding economic opportunities and thus enhancing the welfare of its people.

The Act was intended as a vehicle for the general improvement of the Region through the joint efforts of federal and state agencies.

1967 Amendments - Appalachian Regional Development Act

Several important changes and additions to the Appalachian Regional Development Program were made by Congress in 1967.

Notable among these changes was the mine drainage pollution study designed to determine the magnitude of the mine pollution problem on the Region. The water resources survey schedule and financing were not changed.

Section 206, Public Law 89-4

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A comprehensive water resources study is authorized for the entire Appalachian Region in Section 206 of the Appalachian Regional Development Act of 1965, PL 89-4; the complete text follows:

- "SEC. 206. (a) The Secretary of the Army is hereby authorized and directed to prepare a comprehensive plan for the development and efficient utilization of the water and related resources of the Appalachian Region, giving special attention to the need for an increase in the production of economic goods and services within the Region as a means of expanding economic opportunities and thus enhancing the welfare of its people, which plan shall constitute an integral and harmonious component of the regional economic development program authorized by this Act.
- (b) This plan may recommend measures for the control of floods, the regulation of the rivers to enhance their value as sources of water supply for industrial and municipal development, the generation of hydroelectric power, the prevention of water pollution by drainage from mines, the development and enhancement of the recreational potentials of the Region, the improvement of the rivers for navigation where this would further industrial development at less cost than would the improvement of other modes of transportation, the conservation and efficient utilization of the land resource, and such other measures as may be found necessary to achieve the objectives of this section.
- (c) To insure that the plan prepared by the Secretary of the Army shall constitute a harmonious component of the regional program, he shall consult with the Commission and the following: the Secretary of Agriculture, the Secretary of Commerce, the Secretary of Health, Education and Welfare, the Secretary of the Interior, the Tennessee Valley Authority, and the Federal Power Commission.
- (d) The plan prepared pursuant to this section shall be submitted to the Commission. The Commission shall submit the plan to the President with a statement of its views, and the President shall submit the plan to the Congress with his recommendations not later than December 31, 1968.
- (e) The Federal agencies referred to in subsection (c) of this section are hereby authorized to assist the Secretary of the Army in the preparation of the plan authorized by this section, and the Secretary of the Army is authorized to enter into and perform such contracts, leases, cooperative

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agreements, or other transactions as may be necessary to the preparation of this plan and on such terms as he may deem appropriate, with any department, agency, or instrumentality of the United States or with any State, or any political subdivision, agency, or instrumentality thereof, or with any persons, firm, association or corporation.

- (f) The plan to be prepared by the Secretary of the Army pursuant to this section shall also be coordinated with all comprehensive river basin plans heretofore or hereafter developed by United States study commissions, interagency committees, or similar planning bodies, for those river systems draining the Appalachian Region.
- (g) Not to exceed \$5,000,000 of the funds authorized in Section 401 of this Act shall be available to carry out this section."

Office of Appalachian Studies Organization

As required by Section 206, the Secretary of the Department of the Army directed the formation of a coordinating committee for the study and set up the Corps of Engineers Office of Appalachian Studies as the overall coordinating office.

The Office of Appalachian Studies was composed of an Executive Office with an engineering branch, an economics branch, and an administrative branch. Originating in May 1965, with a staff of four, the office expanded until in 1967 there was a staff of 27 regular employees and 12 temporary employees.

The office was assigned the task of coordinating the work of the various federal and state agencies to include comprehensive engineering planning for water resource development in the Region, to develop new evaluation procedures and goals for Appalachia water and related resources development.

Water Development Coordinating Committee for Appalachia

Under Section 206, the Secretary of the Army directed the foundation of a coordinating committee and designated the Director of the Office of Appalachian Studies as Chairman of the Water Development Coordinating Committee for Appalachia. Composed of members from the 12 states and commonwealths, the main functions of the Coordinating Committee were:

- l. To assure that the plan prepared for submission by the Secretary of the Army would meet the needs of the Region and constitute an integral and harmonious component of the program developed under the Appalachian Regional Development Act.
- 2. To provide a broad basis for development, presentation, and consideration of all pertinent views on the present and future needs of the Region and methods of satisfying these.
 - 3. To advise and assist all participating agencies.
 - 4. To assist in the resolution of problems.
 - 5. To periodically review the programs of work.
- $\,$ 6. To obtain insights into and to help evaluate the effects of water resource project investments on the regional and local economies.
- 7. To advise on the steps local development districts and communities may take to fully realize the benefits of proposed resource development plans.

State members furnished guidance in making appropriate contacts with political subdivisions on particular geographic areas. They furnished information concerning state laws and policy. They served as coordinators of state inputs into the final reports.

Initiation of a State Supplement

The Appalachian program requires that the states exercise the primary responsibility for recommending projects for consideration by the Commission. Each of the states in the Appalachian Region has been requested to summarize its contribution to the overall comprehensive plan of the Corps of Engineers in a state supplement.

This supplement contains the water resource problems and needs of the Region as seen by state and local officials and is designed to fit the overall state water resources development plan of which the Appalachian Region is an important part.

Appalachian Virginia

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The Appalachian portion of Virginia comprises the 21 counties of Alleghany, Bath, Bland, Botetourt, Buchanan, Carroll, Craig, Dickenson, Floyd, Giles, Grayson, Highland, Lee, Pulaski, Russell, Scott, Smyth, Tazewell, Washington, Wise and Wythe, including the 5 independent cities

of Bristol, Clifton Forge, Covington, Galax, and Norton, located within the area. It encompasses 23.6 percent of the land area of the state and ll percent of the 1966 population. (See Figure 1) The principal industries are mining, quarrying, manufacturing, and agriculture. The median family income ranges from \$1,856 in Lee County to \$4,493 in Alleghany County. All of these are below the state average of \$4,964 (1960).

Sub-Regions

The 21 counties of Appalachian Virginia as defined by the Office of Appalachian Studies and shown by the shaded areas in Figure 1 are divided into 3 water resources sub-regions.

Sub-Region G lies in the center of Appalachia and crosses the entire Appalachian Region in a direction nearly north-south. It includes parts of 4 states and 5 physiographic provinces. The states are Ohio, Kentucky, West Virginia, and Virginia. Provinces include the Central Lowlands, Interior Low Plateaus, Appalachian Plateaus, Valley and Ridge and Blue Ridge. The Virginia portion of Sub-region G is comprised of 8 counties and covers most of the New River Basin.

 $\frac{\text{Sub-Region J}}{\text{Provinces.}} \text{ The Virginia portion of the sub-region is made up of 8 counties and covers the Tennessee and Big Sandy River Basins.}$

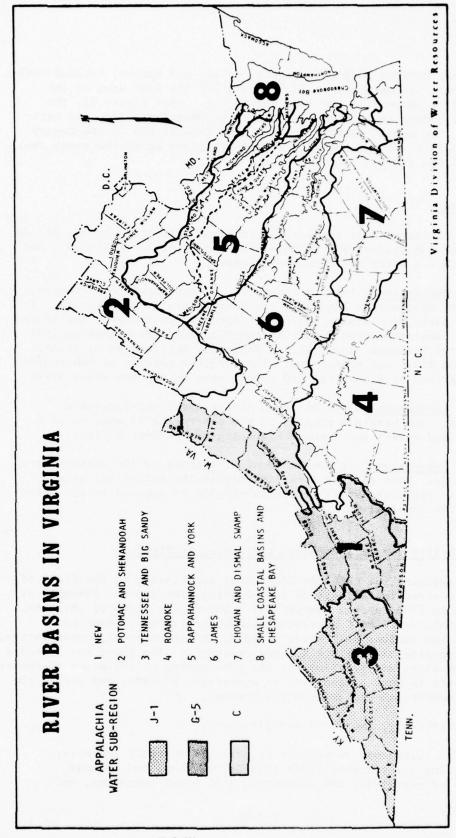
Sub-Region C is comprised of 5 counties in the western part of Virginia. Most of this area lies within the Valley and Ridge Province. Practically all of the sub-region is located in the watershed of the James River.

Responsibility for Water Resources Planning in Virginia

Recognizing the need for additional legislation in the field of water resources investigations and planning, the General Assembly of Virginia in 1966 enacted Chapter 561. Under provisions of this law, the Virginia Board of Conservation and Economic Development was assigned the responsibility for planning the development, conservation, and utilization of Virginia's water resources. The Board was directed to devise plans and programs for the development of the water resources of Virginia in such a manner as to encourage, promote, and secure the maximum beneficial use and control thereof.

Specifically, the Board was directed to

"....proceed as rapidly as possible to study the existing water resources of this State, means and methods of conserving and augmenting such water resources, and



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existing and contemplated uses and needs of water for all purposes. Based upon such studies and after an opportunity has been given to all concerned State agencies and political subdivisions to be heard, the Board shall formulate a coordinated policy for the use and control of all the water resources of the State and issue a statement thereof."

The State plans may include comprehensive water and related land resource plans for each major river basin of Virginia, including specifically the Potomac-Shenandoah River Basin, the Rappahannock River Basin, the York River Basin, the James River Basin, the Chowan River Basin, the Roanoke River Basin, the New River Basin, the Holston River Basin, the Clinch River Basin, the Big Sandy River Basin, and for those areas in the Tidewater and elsewhere in the State not within these river basins or for portions of such basins or areas.

The Board is also authorized to speak and act for the State in all relations with the federal government or with the government of other states, interstate agencies or authorities directly concerning conservation or use of the State's water resources except as otherwise provided by law.

In keeping with the provisions of recent state legislation, the Board has directed the Division of Water Resources to act as its staff in water resource matters. The Division is to prepare a comprehensive plan for water resource development to include the entire State. The overall plan will consist of reports of detailed studies and recommendations for the Virginia portions of the river basins which will be prepared in the order as follows:

- 1. New River Basin
- 2. Potomac-Shenandoah River Basin
- 3. Tennessee-Big Sandy River Basin
- 4. Roanoke River Basin
- 5. Rappahannock and York River Basins
- 6. James River Basin

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- 7. Chowan River-Dismal Swamp Basins
- 8. Small Coastal River Basins

Investigations and studies directed toward the formulation of a plan for the development of the water and related land resources of the Commonwealth of Virginia are being conducted on a river basin basis with the results of investigations and studies to be published in 6 volumes for each of the major river basins of the Commonwealth. Contents of the reports will include the major subject titles as follows:

Volume I - Introduction - includes the basin description (location and size, general physical characteristics of the basin, population and climate, etc.). Also included in this volume are sections on economics, geology, mineral resources, surface water, agriculture and recreation, ground water distribution and potential, existing power development inventory, and existing and proposed reservoir development. Volume I is designed to be an inventory of existing development in the basin. It does not contain a technical review of the problems of the basin nor does it contain solutions to these problems. The volume forms a framework for discussions of technical problems in the basin.

Volume II - Economic Base Study - projects the economic future of the basin to the year 2020. Included are population and employment projections, the industrial outlook for the basin with requirements for development of industrial resources, information on personal income, water costs, existing industrial water use and predictions of future water requirements. The objective of this volume is to provide a guide for effective use of the regional economic resources.

Volume III - Hydrologic Analysis - contains data and discussions of surface water, runoff, ground water supply, climate and meteorology in the basin. The technical analysis of these hydrologic functions is necessary to determine the optimum use of this natural resource in the basin being studied. From these analyses come the high, the low, and the average flows of the stream, the ground water potential and quality, and the climatological and meteorological factors affecting both the surface runoff and ground water reservoirs.

Volume IV - Water Resource Requirements - presents a broad framework for management and a foundation for future studies and reevaluation of the basin. Included are the analysis of existing water supply requirements and predictions of future water needs, erosion and sediment in the basin, the surface water chemical quality, electrical power needs, irrigation water requirements, evaluation of flood damages, and future recreation needs. Water demands are in the most part expressed as ranges encompassing a high figure which may be reached under accelerated growth and a low figure which would be expected under a slower rate of growth.

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Volume V - Engineering Development Alternatives - is a presentation of development alternatives to meet the water resource requirements outlined in Volume IV. It contains chapters on possible reservoir sites, alternatives for meeting water supply and pollution assimilation needs, meeting power demands in the basin, flood control requirements, potential value of water resources in the basin. From these alternatives an overall plan for the basin is selected.

Volume VI - Implementation of Development Alternatives - contains a recommended plan for development and management of water resources in the basin. Each of the comprehensive water resources plans for the major river basins will become a portion of the overall water resource plan for Virginia and will be used to guide future water resource development in the basin. The recommendations in Volume VI are made only after careful consideration by the River Basin Advisory Committee and a public hearing is held to give those who are affected a chance to express their views.

Progress of Studies

The Division of Water Resources has completed the study of the water resources of the New River Basin. The information contained in this study is summarized and included in Sub-Region G-5. A complete listing of the recommendations for the New River Basin in Virginia is also included.

The Division has begun its studies of the Potomac-Shenandoah River Basin, and Volume I has been published in a preliminary form and will be ready for general distribution in the near future. Preliminary field studies and research is also being carried on for future basin studies.

Sub-Region G-5

(a) <u>General</u> - The major part of the Sub-Region G-5 applicable to Virginia is in the New River Basin. The sub-region boundaries have no relation to river basin boundaries (see Figure 1) but are formed by adding or deleting counties that were included in the Appalachian Regional Development Act.

The area of some 11 Virginia counties lies wholly or in part in the New River Basin in Virginia.

(b) <u>Water Management and Development Plans</u> - The Comprehensive New River Basin Water Resources Plan is contained in 6 volumes.

Volume I - Introduction

Volume II - Economic Base Study

Volume III - Hydrologic Analysis

Volume IV - Water Resource Requirements

Volume V - Engineering Development Alternatives

Volume VI - Implementation of Development Alternatives

Volume I of the Comprehensive Study is an introductory volume having the primary function of assisting the reader in becoming more aware of certain factual data concerning the New River Basin in Virginia. Salient points are presented concerning the history and economic characteristics of major political subdivisions within the Basin to include comments related to climate, geology, and topography. An inventory of existing water related developments is also contained in Volume I.

Volume II is an economic base study of the New River Basin in Virginia. Information relating to population growth and areas of future industrial growth are contained in the volume. The volume in general contains an assessment of the economic factors which will influence water requirements and water resource development in the Basin.

Volume III contains an analysis of certain aspects of the hydrology of the Basin. Detailed analyses of low flow and flood flow in various streams of the Basin are presented, and a discussion of climate prevailing in the Basin is included in the volume. An analysis of ground water production potential is included with a presentation of the lithology and hydrology of geologic aquifers of the Basin.

Volume IV is an analysis of projected water resource requirements. The water resource requirements studies include the areas of public and private water supply, industrial water demand, thermal electric generation cooling water demand, waste assimilation water requirements, agricultural irrigation water demands, livestock water demand, and demand for outdoor recreation. An analysis of projected electrical power requirements is also included in the volume.

Volume V includes discussions of development alternatives to meet the water resource requirements outlined in Volume IV. The volume also contains an analysis of the potential value of the water resource in the Basin under a scheme of ultimate development.

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Volume VI contains a recommended plan for development and management of water resources in the New River Basin. The recommendations range from definite project support with some management modification in the case of the proposed Appalachian Power Company Blue Ridge Project to recommendations for further study in those areas of water resource development and protection where adequate data is not available.

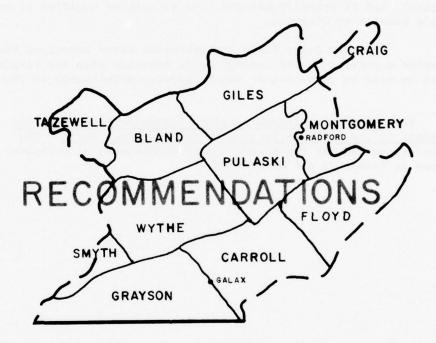
Development of the New River Basin in Virginia for the benefit of areas downstream from Virginia may be proposed in the future. An analysis of the possible effect of three additional reservoirs in the Basin on low flow in the New River is indicated in Volume VI. The value of these reservoirs to states downstream from Virginia would be substantial, and if properly managed, the structures would be of considerable benefit to Virginia.

The New River Basin Comprehensive Water Resources Plan will become a portion of the overall water resource plan for Virginia and will be used to guide future water resource development in the Basin.

(c) <u>Summary of Recommendations for Water Management and</u>
Development in the Virginia Portion of the New River Basin - The
recommendations for the implementation of development alternatives as
contained in Volume VI are as follows:

NEW RIVER BASIN

COMPREHENSIVE WATER RESOURCES PLAN



THE ORDER OF PRESENTATION OF THE SEVERAL RECOMMENDATIONS

DOES NOT INDICATE PRIORITY OF VALUE OR IMPORTANCE

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Recommendation I

Development of the Blue Ridge Site by the Appalachian Power Company Under the Division of Water Resources Management Plan

Development of the Blue Ridge site is essential in any comprehensive water resources plan for the New River Basin. Plate 1 shows the proposed location for the Appalachian Power Company Blue Ridge Project. This project, if constructed by the Appalachian Power Company under the water resources plan proposed by the Division of Water Resources, will be of great value to the area and the State. The Division of Water Resources management plan calls for an allocation of 50,000 acrefeet of storage in the reservoir to be released during periods of low flow for water quality control downstream in the New and Kanawha Rivers. Re-regulation of the releases from Blue Ridge at Claytor Dam to provide a one-day, thirty-year low flow of 1,200 CFS at Radford is an element of the plan. Minimum instantaneous releases from the Lower Blue Ridge Dam would be 260 CFS with weekly average releases of 600 CFS.

The allocation of this storage and the additional release for power generation purposes would limit drawdown in the pool to about 10 feet. This limitation on drawdown will provide a pool having the capability to supply high grade, water-oriented recreation; and, coupled with Claytor Lake, it would provide recreational resource opportunities for thousands of Virginia residents and out-of-state visitors each year. State parks are contemplated in the area of the proposed Blue Ridge Project contingent on management of the reservoir under the Division of Water Resources Plan.

Site development at the Blue Ridge location by the Appalachian Power Company would add potential value for recreation, public and industrial water supply, water quality control, and thermal-electric power generation cooling water. Approximately \$28 million per year of potential value for these uses would be added in the Basin.

The United States Department of the Interior has proposed an allocation of 500,000 acre-feet of water quality storage at the Blue Ridge site for water quality control. The Division of Water Resources has analyzed the plan proposed by Interior (see Volume V) and has concluded that development under that proposed plan would result in a potential annual value reduction of \$7.5 million when compared to the Division of Water Resources Plan. This reduction is exclusive of the value of hydro-electric power that may be realized. The Interior plan would provide additional benefit to the Charleston, West Virginia area; however, this benefit would, in large part, be gained at the expense of value lost to Virginia.

PROPOSED APPALACHIAN POWER COMPANY BLUE RIDGE SITE DEVELOPMENT

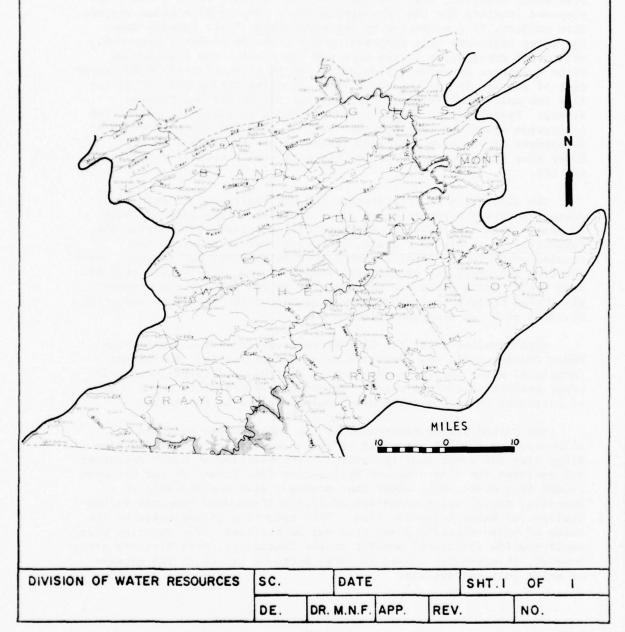


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Recommendation II

That Additional Reservoirs Which May be Established in the New River Basin Shall be "True Multipurpose Developments"

Future Reservoir Sites Which Should be Given Prime Consideration Are on Little River, Big Reed Island Creek, and Reed Creek

Development of the Blue Ridge site by the Appalachian Power Company under the Division of Water Resources Management Plan should provide ample water to meet the Virginia New River Basin needs until 1990. Further development of the Basin's water resource may be needed after that date. Water pollution problems in the Kanawha River Basin outside of Virginia may result in future efforts by the Federal government for further development of water resources in the Virginia portion of the New River.

Development of the water resource in the New River Basin which would aid in overall solution of problems outside the State of Virginia is not an undesirable goal provided that adequate value is left in Virginia for its residents.

At the present time, reservoir sites on Little River, Big Reed Island Creek, and Reed Creek are under investigation by the Corps of Engineers of the United States Army. These sites should be given prime consideration in any ultimate development plan for the Basin. Two of the three reservoirs would discharge water into tributaries of Claytor Lake, while the Little River reservoir would release water to Little River, which enters the New River below Claytor Dam. Development at these sites then would increase streamflow along the entire New River below Claytor Dam. Since the heaviest concentration of large water-using industry is expected in the area between Radford and the Virginia-West Virginia boundary, increases in the minimum flows would be most beneficially used for water supply and water quality control.

A reasonable limitation on drawdown in the reservoirs would also provide additional areas for water-oriented recreation. Volume V of the New River Study indicates the possibility of developing hydroelectric power from sites on Big Reed Island Creek and Little River. Provisions for flood control could be incorporated in all three developments. This flood control storage would be of limited value in Virginia, but would have considerable value for flood protection or reallocated flood storage which would be used for water quality storage in downstream States.

The locations of the three reservoirs now under consideration by the Corps of Engineers are shown on Plate 2. An analysis of the potential value which would be added to the New River Basin by

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additional reservoirs is indicated in Volume V of the New River Study. The potential value that would be added was based upon the recreational value of the lakes, value of released water for downstream industrial and public water supply, value of the released water for waste assimilation and thermal electric generation cooling, value of the sites for hydro-electric power generation and flood control.

The following table indicates certain potential values which development at each site could add to the Basin. A preliminary estimate of the average annual cost is also shown for each reservoir.

Project	Average Annual Cost* (Millions of 1966 Dollars)	Average Annual Potential Value** (Millions of 1966 Dollars)
Little River	1.2	2.8
Big Reed Island		
Creek	1.7	4.5
Reed Creek	0.9	2.4

*Cost based on 50-year amortization period at 3½% interest.

**Average annual potential value based on value for water supply, water quality control, thermal electric generation cooling water, and recreation.

Although the table above provides preliminary estimates only, it indicates that the projects would be of considerable potential value to Virginia. There may be certain problems in connection with any development of the sites, and a careful evaluation of the advantages and disadvantages of each location would be necessary before definite proposals for site development could be entertained.

Being cognizant of the fact that the Federal Fish Hatchery on Reed Creek would be inundated if the Reed Creek Project is constructed the Division of Water Resources prior to any firm proposal for project development on Reed Creek would carefully evaluate other potential reservoir sites up stream from the Town of Wytheville. This evaluation will enable the Division to gauge development at various locations in the area. However, if the reservoir now indicated on Reed Creek is ultimately developed, the timing of the project should be advanced to a date in the future which will permit the realization of a large portion of the benefits from operation of the existing fish hatchery.

Flows in the New River after development of the sites could be as shown in the table on the following page.

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LOW FLOWS IN THE NEW RIVER - ULTIMATE DEVELOPMENT

90% of the Time

New River Station or Location	Existing 1-day 7-da	Existing 1-day 7-day	With Blue Ridg Project 50,000 A	With Blue Ridge Project 50,000 A.F. 1-day 7-day	With River 27,50 Regu	With Little River Project 27,500 A.F. Regulated 1-day 7-day	With Reed Creek Project 18,000 A.F. Regulated 1-day 7-day	With Reed Creek Project 18,000 A.F. Regulated 1-day 7-day	With Big Ree Island Projec 40,000 A.F. Regulated 1-day 7-day	With Big Reed Island Project 40,000 A.F. Regulated 1-day 7-day
Galax	250	340	250	009	250	009	250	009	250	009
Radford	620	950	1200	1500	1566	1700	1666	1800	1890	2025
Glen Lyn	140	1180	1400	1800	1560	1970	1660	2070	1885	2280

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All flows in CFS. Flows at the various stations can be expected to equal or exceed those shown nine out of ten years. NOTE:

RESERVOIR SITES UNDER CONSIDERATION FOR ULTIMATE DEVELOPMENT

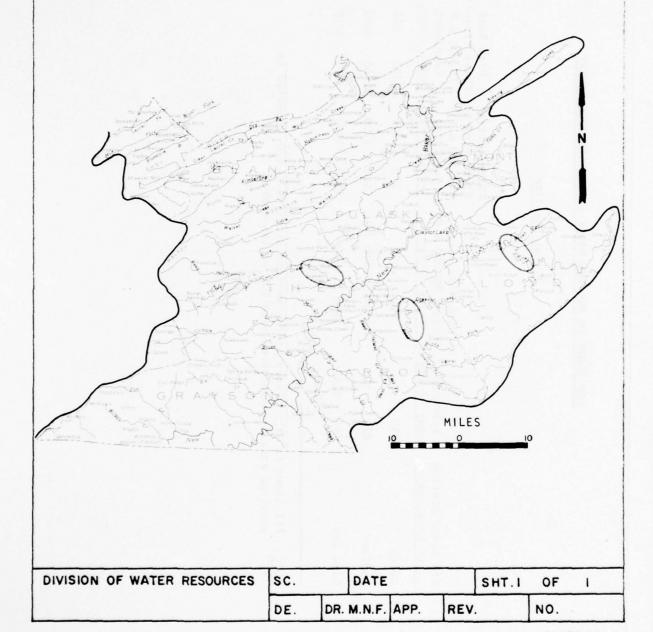


PLATE NO. 2

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Recommendation III

Additional Study of Quality Degradation of Claytor Lake and Long-Range Planning to Insure Its Continued Usability

Claytor Lake at present is the most valuable water-oriented recreation asset in the New River Basin. It is estimated that approximately \$1 million per year is spent for travel and recreational activities at Claytor Lake and Claytor Lake State Park. (See Chapter II of Volume V of the New River Basin Comprehensive Water Resources Plan.)

The effects of water quality degradation in a lake are difficult, if not impossible, to overcome after they have become a fact. The amount of waste that a lake can assimilate without becoming degraded depends upon its hydrological, physical, and biological characteristics. Such characteristics should be determined for Claytor Lake to form the basis for regulatory action to prevent occurrence of adverse conditions.

Adverse quality of water in Claytor Lake may likely be avoided by utilizing the following measures or conditions thereof:

- l. Advanced waste treatment of all waste in Virginia above Claytor Lake to effect nitrogen and phosphorous removal;
- 2. Combination of advanced waste treatment and diversion around ${\mbox{\it Claytor}}$ Lake.

While at the present time it appears that diversion of waste around Claytor Lake is the least costly alternative to avoid potential problems of Claytor Lake, this may in turn result in similar problems downstream.

Recommendation IV

That the Reach of New River Below Claytor Lake and Above
The City of Radford be Protected in Order to Preserve This
Area as a Source of Satisfactory Water Supply

It is estimated that future water requirements of the City of Radford and the Blacksburg-Christiansburg-V.P.I. Water Authority will constitute over 50 percent of the public water supply demand in the lower section of the New River Basin by the year 2000. It is necessary that a good quality raw water source be maintained for these two major water suppliers as well as for other communities in the area

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which may withdraw water from the New River.

The New River between Claytor Dam and the City of Radford is suitable as a raw water source. In fact, the City of Radford now operates a raw water intake above the city. In the event that waste is diverted from the area above Claytor Dam to a point below the dam, it will, of course, be necessary to withdraw water from some location above the waste discharge.

It may be argued that if waste is properly treated, there is no reason to maintain an area of the river which would be free of waste discharge. Although this assumption is sound, treatment standards cannot, as a practical matter, be maintained 100 percent of the time. The very rapid water passage time between Claytor Dam and Radford (approximately 5 hours at a flow rate of 600 CFS at Claytor Dam) makes the problem of contamination and its effect on downstream water supply very critical.

Recommendation V

Overall Support of Local Watershed Conservation Measures

And Support of Public Law 566 Projects: Encouragement of the

Practice of Providing Water Quality Storage in Projects Which

Include Additional Water Supply Storage

The United States Department of Agriculture, Soil Conservation Service (SCS) is rendering important service in upstream watershed conservation and development. At the present time, legislation regarding SCS type PL-566*/ projects permits the provision of water supply storage in reservoirs constructed by the Soil Conservation Service. A number of small SCS reservoirs having water supply storage have been constructed in the State.

At the present time, SCS reservoir projects are limited to maximum drainage areas of 250,000 acres. A total maximum reservoir size of 25,000 acre-feet is stipulated in the amended PL-566 project legislation. Benefits which can be provided in these reservoirs are limited to flood control, water supply, recreation, and conservation. Possibly pending amendments would change the existing legislation to permit the storage of water for water quality control downstream and enable the provision of this storage on a cost-sharing basis between the Federal Government and local interests.

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^{*/} PL - Public Law, U. S.

Because of the nature of the SCS reservoir program, it is possible to locate reservoirs with water supply storage on watersheds which would have little or no flow in streams below the projects during certain periods of the year. The water removed from the reservoirs for water supply is often converted to waste discharge following use. This waste discharge is then released into the drainage area downstream from the reservoir. When it is realized that each gallon of waste discharged may require between 10 and 20 gallons of fresh water flow to assimilate satisfactorily conventional treated effluent, the implications of providing water supply without an accompanying quantity of water for waste assimiliation becomes evident.

Recommendation VI

The Construction of Reservoirs in the Bluefield Area on

Mud Fork and/or Brush Fork for

Public Water Supply and Water Quality Control

The Bluefield, Virginia-West Virginia area has the most critical water supply and pollution control problem in the entire New River Basin in Virginia. Existing water supplies for the area cannot meet anticipated public water supply and industrial water requirements without additional development. The Bluestone River below Bluefield is degraded with dissolved oxygen concentrations approaching zero for extended periods during the summer months. Water quality standards have been established which will permit the Bluestone River to be used for industrial water supply. The standards for industrial water supply are relatively low.

Should the public interest dictate, quality of water in the Bluestone River downstream from Bluefield must be improved. Improvement can be accomplished by providing a high degree of waste treatment and by the provision of additional water in the stream during periods of low flow. Additional water supply will be needed during the summer periods in the Bluefield area. Additional water requirements can be supplied from the proposed reservoirs. It is felt that a combination of high degree waste treatment and flow augmentation will best meet the needs of the area if a higher quality water is desired. Provision of flood control storage in the reservoirs will benefit downstream areas.

Plate 3 indicates stage-storage and stage-area relationships in Mud Fork and Brush Fork. Water provided in either reservoir would meet water quality and water supply needs until 1990. The following table indicates preliminary costs for the impoundments and a high degree of waste treatment for the area. It should be understood that approximately 25 feet of reservoir drawdown would be required in each

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reservoir during the summer months. This drawdown would not permit high-grade recreation at the project sites, but a high quality Bluestone River below the Bluefield area would result.

	Average Annual Cost	Capital Investment
Impoundments on Mud Fork, Brush Fork	\$314,000	\$4,000,000
Waste Treatment and Flow Augmentation Diversion Piping	\$271,000	\$2,800,000

Note: Above costs include amortization of investment over 20 years at 4½% interest and normal operation and maintenance, secondary treatment assumed. All costs are preliminary and should not be considered final estimates.

Recommendation VII

That Careful Consideration Be Given to the Subject of Possible

Nutrient Enrichment by Future Waste Discharges

In the New River Below Radford

The New River between Radford and the Virginia-West Virginia boundary has great capability for satisfactory assimilation of organic waste and to maintain desirable concentrations of oxygen. From the standpoint of organic loading and resultant dissolved oxygen, a large increase in waste loading on the stream could be tolerated; however, the existing concentration of nitrogen in the river is above the value considered to be desirable. As waste loading on the river increases, both nitrogen and phosphorous concentrations will tend to rise, and undesirable algal growth may occur.

It is important, therefore, to evaluate the river from the viewpoint of existing nutrient loading and the possibilities of reducing the existing load as well as future nutrient loads, if necessary.

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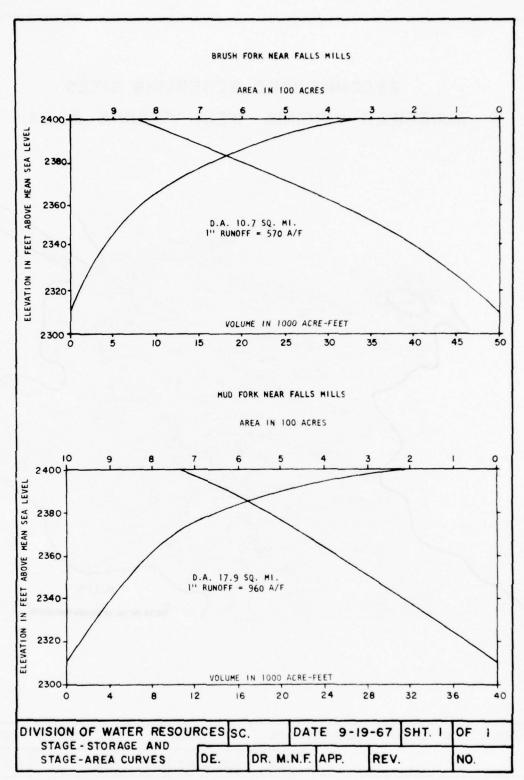


PLATE NO. 3

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RECOMMENDED RESERVOIR SITES BLUEFIELD VIRGINIA - WEST VIRGINIA AREA

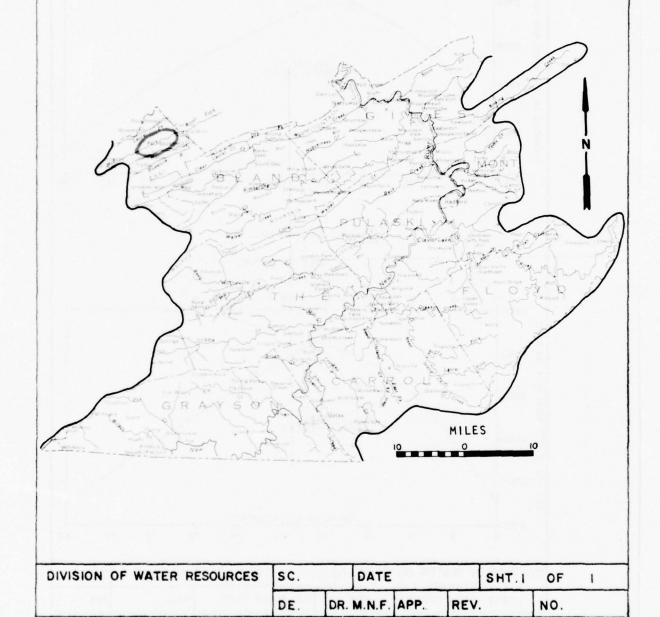


PLATE NO. 4

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Recommendation VIII

Implementation of a Floodplain Information Study In The Bluefield, Virginia-West Virginia Area

The Bluefield, Virginia, and the upper Bluestone River areas suffer average annual flood damages of over \$79,000. Areas in the Town of Bluefield, Virginia, are flooded frequently and incur heavy damages from the Bluestone River and Beaver Pond Creek.

A detailed floodplain information study of the Bluefield Virginia-West Virginia area has never been made. Until the results of such a study are known, it will not be possible to make a meaningful analysis of the flood problem and the cost of alternatives to minimize the flooding.

The Corps of Engineers of the United States Army is authorized to make floodplain studies under provisions of Section 206 of the 1960 Flood Control Act (Public Law 86-645, 14 July 1960). An extract from the Act is as follows:

"That, in recognition of the increasing use and development of the flood plains of the rivers of the United States and of the need for information on flood hazards to serve as a guide to such development, and as a basis for avoiding future flood hazards by regulation of use by States and Municipalities, the Secretary of the Army, through the Chief of Engineers, Department of the Army, is hereby authorized to compile and disseminate information on floods and flood damages, including identification of areas subject to inundation by floods of various magnitudes and frequencies, and general criteria for guidance in the use of flood plain areas; and to provide engineering advice to local interests for their use in planning to ameliorate the flood hazards: Provided, that the necessary surveys and studies will be made and such information and advice will be provided for specific localities only upon the requests of a State or a responsible local governmental agency and upon approval by the Chief of Engineers."

Data developed in a floodplain information study would include flood profiles, flood records, flood characteristics, flood frequency estimates, and floodplain delineation.

A floodplain study of the area would give local planners and interests information on which to make logical decisions on floodplain

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use. The study would also contain technical data which should permit an analysis of alternative means of flood protection.

The responsibility of the governing body requesting this study is fourfold. They must (1) furnish available information; (2) make the report available to the public; (3) provide copies to public information media and planning and regulatory agencies, and (4) preserve and safeguard survey markers. No financial obligation is necessary other than the fulfilling of these 4 requirements.

Recommendation IX

That a Systematic Program of Floodplain Information Studies Be Initiated Throughout the Basin

Average annual flood damage costs in the New River Basin of Virginia, exclusive of the Bluefield area, are estimated to be \$392,000. Of this amount, \$57,000 in annual flood damages occur along the New River floodplains and the remaining \$335,000 occurs along 20 tributaries to the New River. Unwise development in the future could result in greater monetary losses from flooding. Methods of flood-proofing for existing development could reduce present damages significantly.

There are over 30,000 acres of floodplain along the more than 500 miles of streams in the New River Basin in Virginia. In addition, there is an unknown amount of developable land lying immediately above the undefined floodplains in the Basin which is not being utilized because flood elevations have not been delineated.

The Flood Control Act of 1960, Public Law 86-645, Section 206, authorizes the United States Army Corps of Engineers to make floodplain information studies "only upon the request of a State or political subdivision thereof."

Floodplain information studies provide the necessary criteria for guidance in planning development of the Basin's floodplains. Included in a floodplain information study would be floodplain delineations, maps or mosaics of the valleys, flood profiles, photographs, and a narrative describing the extent of flooding that may reasonably be expected in the future. The Corps of Engineers may provide technical assistance in interpreting the study report and in flood-proofing.

The responsibility of the governing body requesting this study is fourfold. They must (1) furnish available information; (2) make the report available to the public; (3) provide copies to public information media and planning and regulatory agencies, and (4) preserve and

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safeguard survey markers. No financial obligation is necessary other than the fulfilling of these four requirements.

Because there is a large amount of developable land in the New River Basin in Virginia, and because there are significant economic losses from floods annually (on an average basis), and because no floodplain information studies are available, it is recommended that the responsible governing bodies request, through the Commissioner of Water Resources, */ floodplain information studies for these areas of the New River Basin where the information contained in such a study is deemed to be needed for the proper planning and development of that area.

Recommendation X

That Investigation of Ground-Water Occurrence, Distribution and
Potential be Initiated Basin-Wide or in Localities Where
Need Exists or is Anticipated

Ground-water development alternatives have been outlined in Volume V of the Comprehensive Water Resources Plan, New River Basin, and implementation of these alternatives is suggested to achieve profitable and equitable utilization and management of ground water.

Services made possible by the science of ground-water hydrology are available to assist in the advancement of utilization of the water resources of the New River Basin.

Various and alternative proposals for the development of ground water may be set forth with respect to financial and organizational means, and geographical and operational aspects. No attempt is made here to comment upon these means and aspects. Choice is made among alternatives by matching results of geological and engineering investigations against requirements. This may be done in a single well project in a large potential well field by county or by other appropriate subdivision of the River Basin.

Upon realizing or foreseeing a need for supply of ground water, it is recommended that planning for the satisfaction of these needs include the typical steps itemized in Volume V, page 68, of the New River Study. In brief review of those items, geohydrologic investigation usually is the first step. It includes an inventory of wells,

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^{*/} Commissioner, Division of Water Resources, 911 East Broad Street, Richmond, Virginia 23219

springs, and usage of ground water which will provide a basis for establishment of observation wells to be used in gauging of fluctuation of reservoir levels and for monitoring of quality. Pumping tests and observation wells will supply information for determining safe annual yield.

Counties, municipalities, industries, or individuals can obtain reports on ground-water potential and development feasibility by retention of independent geologic and engineering consultants or by requesting a State agency to enter a cooperative agreement to undertake such works, the objective being the profitable and equitable utilization and management of ground water.

Recommendation XI

That A Comprehensive Study of Waste Disposal be Made in the Basin

With Particular Emphasis on the Effect of Solid Waste on the

Quality of Ground and Surface Waters

Water pollution caused by improper solid waste disposal can be a serious problem. The Division of Water Resources has not made studies in the New River Basin to determine the possibility of water quality deterioration by improper solid waste disposal. In order to establish the basis for a program of minimizing solid waste disposal problems in the Basin, it is necessary that a comprehensive study of disposal be made.

The problem of solid waste disposal encompasses factors of environmental health other than water quality deterioration, and any study of the solid waste problem should include a consideration of all environmental health aspects relating to solid waste disposal. The Virginia State Department of Health through its Bureau of Solid Waste and Vector Control has the capability of making necessary studies and developing appropriate recommendations for adequate solid waste disposal. At the present time, the Bureau is involved in a State-wide study of solid waste disposal and has completed a solid waste disposal plan for Pulaski County. It is anticipated that all major political subdivisions in the State will be included in the study, and if the recommendations of the Health Department are followed, the problems associated with improper solid waste disposal will be greatly reduced.

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Recommendation XII

That the Comprehensive Water Resources Plan be Reviewed by the Commission of Outdoor Recreation to Determine the Basis for Expanding the Recreation Developments in the Area

Considering the high potential for outdoor recreation in the New River Basin, a study would be conducted by the Commission of Outdoor Recreation. This study would include specifics for additional recreational development based upon the proposed water reservoirs and the regulated flows in sections of the New River. The New River Basin Advisory Committee, with its knowledge of the Comprehensive Water Resources Plan, would be in a good position to coordinate the recreation study associated with the water resource developments.

Recommendation XIII

That a Minimum of Two Continuous Water Quality Monitoring Stations

Be Established in the Basin and that the Rate of Flow From All

Future Major Impoundments be Continuously Monitored

At the present time, the New River throughout its length in Virginia is generally a stream of excellent chemical quality. There are, however, considerable differences in quality in the river above Claytor Lake and below the City of Radford. These changes are explained in part by the different geological areas which the river drains and the different usage of the river in the two areas.

It is anticipated that heavy industrial use will be made of the New River below Radford in the future. Present projections of future industrial growth do not indicate that the river above Claytor Lake will be as extensively used for industrial water supply and waste assimilation as the reach of the river between the City of Radford and the Virginia-West Virginia boundary. Monitoring of the river above Claytor Lake and at Glen Lyn should give a representative picture of river quality in two areas which will vary considerably in their pattern of usage. It is important that monitoring of the quality be on a periodic basis within the daily 24-hour period.

The second part of the Recommendation relates to flow measurement in streams. Major impoundments can greatly affect flow patterns in reaches of streams below the impoundments. The rate of flow from future reservoirs which will be constructed in the Basin must, therefore, be continuously monitored.

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Lecommendation XIV

That the New River Advisory Committee be Continued with a View Toward Its Guiding the Water and Related Land Resources of the Basin Substantially in Accordance with the Plan Herein Presented

The recommended plan in Volume VI will serve as an overall guide to future water resource development in the Basin. Over a period of time, however, the timing and the exact nature of required future water resource development will have to be evaluated in greater detail. The Virginia Division of Water Resources has the overall State responsibility for planning water resource development. In order to continue effectively, it will be necessary that communication between the people in the Basin and this Division be continued. The Advisory Committee is comprised of representatives from each major political subdivision in the Basin and is well suited to carry out the necessary liaison.

Problems which are not now foreseen relating to water resources will undoubtedly arise in the future. The Advisory Committee will be able to give careful consideration to these problems and in certain instances may recommend appropriate action to be taken by the political subdivisions. In the future, if the need for local financing is apparent, local governments can coordinate activities with the Committee. It should be noted that Basin planning and implementation of plans will be a matter for continuing consideration, and the need for an active committee will extend far into the future.

Conclusions

Volume VI, the last in a series of six volumes treating studies leading to the formulation of a New River Basin Comprehensive Water Resources Development Plan, contains a statement of policy for development and management of the water resources in the New River Basin of Virginia. The policy presented in the form of 14 recommendations seeks to fulfill, insofar as the New River Basin in Virginia is concerned, the principles set forth in Chapter 561, 1966 Acts of the General Assembly, and is considered an interim statement of a coordinated State policy for the use and control of the water resources of the Commonwealth. It should be realized that the policy outlined in Volume VI is not inflexible. With the progression of time needs will be defined more accurately, and subjects not treated in the current plan may become factors of significant importance in the future. The policy outlined in Volume VI does present a definite program designed to assist in the making of appropriate decisions, and by which future Basin development can be measured. Recommendations in Volume VI range from

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specific project support to the acknowledgment of and recommendation for needed additional study, and an assessment of that which at this time appears to be the optimum framework for ultimate development in the Basin.

Views of concerned State agencies as well as those of the citizens in the Basin have been considered in the formulation of the aforementioned policy. These views were obtained through members of the New River Basin Advisory Committee which represent political subdivisions in the Basin and from statements received at a public hearing held at Radford, Virginia, on December 12, 1967. Reports of the study were reviewed by appropriate State, local, and federal agencies and comments received from the various entities have been carefully considered throughout the preparation of the Plan.

Sub-Region J-1

(a) <u>General</u> - The sub-region contains 8 counties in Tennessee and 6 counties in Virginia within the TVA area and 2 counties outside the TVA area.

The 8 southwesternmost counties in Virginia in this subregion and the 2 independent cities are part of 2 river basin planning areas in Virginia (see Figure 1).

A tabulation of the 8 counties and the drainage area in each river basin is listed in Table 1.

Table 1

County or City	Total Drainage Area (Sq. Mi.)	Drainage Area In Tennessee-Big Sandy	Drainage Area In New River
Lee	438	438	
Scott	539	539	
Wise	412	412	
Washington	579	579	
Dickenson	335	335	
Russell	483	483	
Tazewell	522	378	144
Buchanan	508	508	
TOTA	3,816	3,672	144

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The Tennessee-Big Sandy River Basin comprises about 10 percent of the area of Virginia. The headwaters of Tennessee River flow southwestward from Virginia into the State of Tennessee in 4 main, nearly parallel tributaries. From east to west they are the South and North Forks of Holston River, the Clinch and the Powell Rivers. Straight Creek, Middle Fork of Holston River, Little River, Big Moccasin Creek, Copper Creek, and Guest River are the larger feeders to the 4 main tributaries.

The watershed of the Tennessee River in Virginia includes that portion of the Blue Ridge Physiographic Province which sloped northwestward from Mount Rogers (5,729 feet in elevation) and its adjacent peaks. The greatest part of this watershed lies in the Ridge and Valley Physiographic Province with its typical folded geological structure and alternating long, narrow ridges and valleys oriented northeast and southwest. The western edge is in the Cumberland Plateau Physiographic Province where rock strata lie nearly flat. Elevations vary from 5,729 feet in the east to about 1,190 on the river profiles of both the Clinch and the Powell Rivers at the interstate boundary. This variation of 4,539 feet in topographic relief is the greatest to be found in any basin in Virginia. This basin also exceeds others in average annual precipitation which varies between 40 inches in the northeast to 50 inches in the western extremity. Thus, the average runoff is high and is estimated to be 4,690 cubic feet per second or about 1.48 cubic feet per second from each square mile in the watershed. Base flow is fairly high due to the large storage of ground water from which flow numerous large springs.

The Tennessee Valley Authority hydro-electric installation that affects the Virginia portion of the Basin is the South Holston Dam which impounds water in the South Fork of Holston River in Washington County. Clear Creek Dam and Beaver Creek Dam are TVA developments.

The Big Sandy River has two major tributaries. Tug and Levisa Forks, and these have their highest headwaters in all or portions of 4 Virginia counties. Its watershed has a total drainage area in Virginia, Kentucky, and West Virginia, or 4,283 square miles, 992 of which are in and comprise $2\frac{1}{2}$ percent of Virginia.

The Big Sandy River is about 164 miles long, 30 of which are along Levisa Fork in Virginia. The main direction of flow is northwestward in the upper reaches and northward in the lower where it empties into the Ohio River. The basin is typically narrow near the mouth of the river and flairs to a width of 91 miles in the headwaters area. From this area to the mouth the airline distance is 105 miles.

The topography of the Big Sandy watershed is mountainous and rugged in Virginia as well as in the neighboring states. All of the

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Virginia portion lies in the Cumberland Plateau Physiographic Province in which are great thicknesses of sandstone, some shale, and major commercial coal seams. These strata dip gently to the north or northwest. In the headwaters area, as well as in areas of the middle reaches, main streams and their very numerous, usually short tributaries have eroded deep, narrow, V-shaped sinuous valleys between steep-sided ridges which often are nearly flat topped. Floodplains are few and narrow. The greatest elevation in the basin is over 3,700 feet, and the elevation on the Levisa Fork profile at the interstate boundary is about 840 feet.

Runoff averages 1,170 cubic feet per second or 1.18 cubic feet per second from each square mile. Base flows are low as a result of scant storage of ground water. Due to steep slopes and the impervious nature of the terrain, floods are flashy, often are high, and are relatively frequent.

The main tributaries rising wholly in Virginia are, southwest to northeast, Pound River, Russell Fork, and Levisa Fork. One branch of Tug Fork rises in Tazewell County. Pound River runs into Russell Fork and the latter into Levisa Fork which joins the other main tributary, Tug Fork, to form Big Sandy River 26.8 miles above its mouth. Cranesnest River feeding Pound River and Slate Creek feeding Levisa Fork in Grundy are two of the more important minor tributaries.

The John W. Flanagen Reservoir and the North Fork of Pound Reservoir have been completed by the Corps of Engineers.

- (b) <u>Problems and Needs in the Tennessee-Big Sandy</u> From the limited information available after a preliminary review of this basin, the major problem is in the proper delineation and control of the floodplains in the many valleys in the basin. The problems of stream pollution are present. In the Tennessee Basin the problems of meeting water supply and water-based recreation are present.
- (c) <u>Summary</u> The sub-regional evaluation of developmental needs and opportunities of the Tri-Cities Planning Area (J-1) by TVA Regional Studies staff has pointed out the problem of the pollution of the North Fork of the Holston River which precludes its use for any purpose other than waste discharge.

Since the pollution of the North Fork of the Holston is a problem and the high-value chemical industry producing the chemical wastes is vital to the economy of the area, the possible solutions to the problem could be included in the development of water resources in Appalachia.

It has been suggested that a dam at Brushy Mountain Gap with a drainage area of about 59 square miles could be developed for multi-purpose use, one of which would be the control of low flow to

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dilute the calcium chloride and sodium chloride below Saltville, Virginia.

The TVA report points out that local flooding is another major water resource problem.

The possibility of developing watershed development projects under the Department of Agriculture is being studied on five watersheds at this time. These are Copper Creek, Indian Creek, Martin Creek, headwaters of Holston River, and headwaters of Clinch River.

The topography of the area makes it difficult to justify Public Law 566 projects under present Watershed Protection and Flood Prevention Act. It would seem highly desirable under the Appalachian Act to determine which of the watersheds have the possibility of producing benefit/cost ratios .75 to 1 and proceed with detailed plans for these with a view of improving the upstream watershed areas in Appalachia and depending upon secondary benefits for further justification.

Storage for flood control, water supply, recreation, water quality control, fish and wildlife should be included in the watershed developments.

Sub-Region C

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(a) <u>General</u> - The sub-region contains 5 counties in Virginia (see Figure 1). A listing of the 5 counties and the drainage area in each river basin is listed in Table 2.

The major portion of the Sub-region C is in the James River Basin. The average runoff is about 1.1 cubic feet per second from each square mile.

- (b) <u>Problems and Needs in Sub-Region C</u> From the limited information available after a preliminary review of the James River Basin in Sub-region C, there is a need for floodplain control, stream pollution abatement, development of the water-based recreation resource, and water for future industrial and municipal use.
- (c) <u>Summary</u> The sub-regional evaluation of developmental needs and opportunities of Sub-region C has developed a plan to include the Gathright Reservoir, the Hipes Reservoir, land treatment measures, national forests development, and upstream watershed development.

The Appalachian Regional Development Act of 1965, under Section 206, stresses major emphasis on identifying opportunities for investments in areas displaying significant potential for future growth, giving special attention to the need for expanding economic opportunity

and thus enhancing the welfare of its people.

It is felt that the Hipes development plan formulated in accord with the economic criteria specified in Senate Document No. 97, 87th Congress, entitled "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources," does not give enough weight to limiting drawdown in the Hipes Reservoir for quality recreation to be developed properly at the intended site.

Since the major potential benefit of the Hipes project is to be from recreation, a pool fluctuation of 30 feet will tend to discourage private investments, if such an opportunity is made available to private concerns.

Economic growth from regional recreation will, in all probability, be limited both at the Hipes and Gathright projects due to a large pool fluctuation; therefore, it is recommended that in the interest of economic development of the area that pool fluctuation be limited to 10 feet at both the Hipes and Gathright projects and that the height of the Hipes Dam be raised to take full advantage of the site.

Goals and Objectives

Virginia's goals and objectives for the development of the Virginia Appalachian program are contained in a volume prepared in the Office of the Director of Industrial Development who coordinates with the Appalachian Regional Commission in all matters relative to Virginia's activities in the program for Appalachia (Attachment A).

This volume looks at the Virginia region's problems and potentials and includes a chapter on growth areas of the region including specifically economic functions, prospects and reasons for future growth, problems impeding growth, and programs recommended. Also included in this volume are chapters on relative financial resources of local areas, state research projects, coordination of development work, plans for financing development districts, and goals and objectives of the Virginia Appalachian program.

Conclusion

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It is anticipated that comprehensive water resources studies being made and yet to be undertaken by personnel of the Division of Water Resources, Commonwealth of Virginia, will identify more clearly the need for water resources development works in the Virginia portion of the Appalachian Region. It is hoped that the results of these studies may

TABLE 2

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Drainage Area in Roanoke					83	1	83			
Drainage Area in Potomac	108					1	108			
Drainage Area in New				57		1	45			
Drainage Area in James	308	940	947	291	797	7	2,053			
Total Drainage Area (Sq. Mi.)	917	540	947	336	549	4	2,291			
County or City	Highland	Bath	Alleghany	Craig	Botetourt	Covington	TOTAL			

be appropriately incorporated in plans for development of the water resources of the Virginia portion of the Appalachian Region.

II. THE REGION'S PROBLEMS AND POTENTIALS

The Appalachian portion of Virginia comprises the 21 counties of Alleghany, Bath, Bland, Botetourt, Buchanan, Carroll, Craig, Dickenson, Floyd, Giles, Grayson, Highland, Lee, Pulaski, Russell, Scott, Smyth, Tazewell, Washington, Wise, and Wythe, including the 5 independent cities of Bristol, Clifton Forge, Covington, Galax, and Norton, located within the area. It encompasses 23.6 percent of the land area of the State and 11 percent of the 1966 population (see Appendix Table 1).

Many of the problems of Virginia's Appalachia are traceable to a history of reliance on industries with declining roles in a maturing economy. With the development of labor-intensive farming, lumbering, mining, and railroading operations, the area's population growth exceeded that of the State from 1880 to 1940. Then from 1940, as the State's rate of growth picked up this area slowed down: from a 15 percent increase in the 1930's to 5 percent in the 1940's and an 8 percent decline in the 1950's. The 1960 Census reported that 7 percent of the labor force was unemployed*/ (in spite of substantial out-migration in the past 20 years) and that the median family income was below the State average for every county in the region, with 44 percent of the families receiving incomes under \$3,000 in 1959 (see Appendix Table 2). One-fourth of the housing units were reported deteriorating, and 12 percent dilapidated.

Limited education and skill levels compounded the problems of adjusting to new jobs. The median years of school completed by the population 25 years old and over in 1960 varied from 6.5 to 8.8 among the 21 counties comprising the region, whereas the national average was 10.6. Of the population 7 to 15 years old, 6.7 percent were not enrolled in school, compared with 3.1 percent for the nation. In the mid-sixties, expenditures per pupil in average daily attendance were below the Virginia county median in 18 of the 21 counties, and 19 counties had lower proportions of teachers with college degrees (see Appendix Table 3). Educational television facilities are available in less than half of the region, and public libraries are lacking in one-third.

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 $[\]pm$ / The Economic Research Service estimates that 23 percent of the labor force was underemployed and a large number of working age, especially women, were not in the labor force.

Health needs pose another serious problem, especially the incidence of tuberculosis, which was more than double the national average for new cases reported in 1965. There are serious shortages in the number of practicing physicians and dentists in most of the Appalachian counties, and in the number of general hospital beds in half of them (see Appendix Table 4). The State Health Department reports a widespread lack of sewage treatment plants in all sections of the region and a number of deficiencies in treated water supplies.

The rugged terrain is a factor seriously restricting growth in several parts of the region, where steep slopes restrict the land available for building construction, retard travel, and constrict surface waters into narrow valleys subject to frequent floods.

Climate and terrain pose another problem of increasing concern in development planning, that of the potential for air pollution inherent to the region because of frequent low-level temperature inversions in the atmosphere (see Appendix Table 5). Some of the current research programs on air pollution include studies of the effectiveness of rain in purifying polluted atmospheres; these will be watched with especial interest in view of the region's comparatively heavy rainfall.*/

A persistent handicap for economic development is the limited cooperation among the people of adjacent counties and cities in the region. Such efforts to pool talents and resources for developmental activities are well established in other parts of the State and have contributed much to accelerated, orderly growth. Four such organizations are under way in Virginia's Appalachia and are described below, but most of the region lacks even a beginning in multi-county development efforts.

A related problem is the widespread lack of adequate zoning ordinances. This situation is particularly critical where mountainous terrain limits the supply of land available for industrial development, a common situation in Virginia's Appalachia. The careless preemption of scarce industrial sites by commercial and residential construction compounds an already difficult problem. The State Planning Division has augmented its staff of local planning specialists, and the local planning efforts of counties and cities are improving, but the problem is urgent.

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^{*/} The land capability criteria concerning air drainage, climate and precipitation in the V.P.I. Usable Land Study (infra.) are also expected to shed light on this problem.

In spite of its problems, the region has all of the essential requirements for growth. The annual rainfall of 35 to 55 inches can provide water of suitable quality and quantity for industrial and residential uses in the foreseeable future if stored in wet seasons for use in dry ones. The New River, at the center of Virginia's Appalachia, has the highest base-flow of any stream in the State and quality of water better than most. It has been further improved with a large storage dam in Pulaski County, and another large dam is proposed for construction upstream in Grayson County. The extremely variable flow of the Pound River has been regulated by the construction of two large storage dams in Dickenson and Wise Counties, and that of the Jackson River is scheduled for control by a large dam in Bath County. The southwestern 3,000 square miles of the region lie in the Tennessee River Basin. No large storage dams are planned for these variable-flow streams, but a number of small watershed projects are expected to provide some flood control and water supply benefits in upstream areas of all major river basins in the region.

Quick and easy access to markets, materials, and labor is another essential ingredient for growth. Major highway improvements have been authorized that will bring interstate or development highways to all of Virginia's Appalachian growth centers by 1975 (see foldout map in Appendix). All are presently served by a rail network providing daily freight service. However, there are no navigable rivers in the region.

The labor supply for each growth center is described below. As reported in the 1967 Appalachian Investment Plan, the education and training of the labor force are being rapidly upgraded. The Department of Community Colleges is operating 2 more; the Department also provides curricula, equipment, instructors, and quarters for manpower training assistance for new or expanding industrial plants. Seven new vocational high schools were approved for construction in the region in fiscal 1967, and 5 more are planned for fiscal 1968. Current expenditures per pupil in average daily attendance in Virginia public schools was 98.6 percent of the national average for the 1966-1967 academic year; data for counties are not yet available.*/ Projects are being planned for fiscal 1968 to extend educational television and NDEA teacher demonstration facilities to every school district in the region.

Electric power, coal, and fuel oil adequate for every need are available in all parts of the region. Natural gas is currently available in 7 of the 9 growth centers, and a pipe line is under construction to another one.

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^{*/} National Education Association, Rankings of the States, 1967.

Mineral resources include extensive deposits of dolomite, limestone, and quartzite throughout the region and bituminous coal in the southwestern 7 counties. The coal mining industry is well established, with production rising at an average annual rate of nearly 5 percent and payrolls per employee at 6.5 percent in the 1960's (see Appendix Table 6). The variety of mineral deposits involved in current extractive operations in the region is shown in Appendix Table 7. Related processing plants include 9 for producing industrial inorganic chemicals and 3 in primary metal processing.

Timber resources in the Southern Mountain forest survey unit, which includes most of Virginia's Appalachia, are increasing rapidly. From 1957 to 1966, softwood sawtimber increased at an average annual rate of 1.4 percent and hardwood sawtimber increased at an average annual rate of 1.5 percent (see Appendix Table 8). The combination of improved stands and better access roads in the next few years should accelerate the growth of the region's woodbased industries.

The 4 multi-county development organizations now under way in the region constitute an important part of its resources for growth, which should be extended into other parts of the region in the near future. Meanwhile, county, city, and town development agencies have been active in numerous localities: a recent report shows that 17 percent of the manufacturing employment in plants established in the 1960's is in the Appalachian portion of the State.*/

Growth Centers

Bristol-Abingdon (along Interstate 81)
Buchanan-Roanoke (along Interstate 81 and Highway 220)
Covington-Clifton Forge (along Interstate 64)
Duffield-Wise (along Highway 23)
Galax-Hillsville (along Highway 58)
Lebanon-Bluefield (along Highways 19 and 460)
Marion-Wytheville (along Interstate 81)
Pulaski-Narrows (along Interstate 81 and Highway 460)

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^{*/} John H. Hunter, New Manufacturing Plants in Virginia Since 1960, Virginia Division of Industrial Development.

III. GROWTH AREAS

Figure I delineates the sub-regions of Virginia's Appalachia that are deemed to have significant growth potentials. Centers for likely industrial development are circled in green, and their related labor supply areas are outlined in blue. Two of the growth centers lie partly outside the State and 1 entirely so (though still within the Appalachian Region), and 2 are partly outside the Region.

Of the 8 growth areas with growth centers largely in the State, a former downward trend of population has been reversed in 4 areas, an established upward trend has accelerated in 3, and a downward trend has slackened in 1 (see Appendix Table 18). The past out-migration trends are tapering off, and net in-migration rates are increasing. */ Interstate or Appalachian development highways are scheduled for completion in all 8 growth centers by 1975.

As was stated in the 1967 Investment Plan, the entire Valley Section from Bristol to Buchanan is expected to develop industrially. For the present, we have designated those portions of this section as growth centers where the most rapid growth is expected.

Duffield-Wise Area

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The Duffield-Wise growth area has a greater potential labor supply than any other in Virginia's Appalachia, though it ranks third among them in total population (see Appendix Tables 9 and 10). The area is roughly coterminous with the Lenowisco Economic Development District, whose overall economic development program is the main source for the following discussion.

The area's growth center is located on U. S. Highway 23, a part of Appalachian Development Corridor B, where a 4-lane divided highway is planned for completion by 1975. This will place the center within 1 hour's driving time of Interstate Highway 81 (see foldout map in Appendix). Six different railroads serve the area, and it contains 2 general service airports.

<u>*/</u> <u>Cf.</u> Virginia Division of Industrial Development & Planning, <u>Southwest Virginia: A Case for Economic Growth</u>, pp. 36, 39; Virginia <u>Division of Planning, Projections and Economic Base Analysis: Bristol-</u> <u>Kingsport Metropolitan Area</u>, p. 13; and <u>Roanoke Metropolitan Area</u>, p. 10.

Natural Resources --

"The beautiful, rugged but regular topography of the District is one of its most important assets. The mountains are easily viewed from almost anywhere providing a 'scale' that is particularly attractive. As well as insuring beautiful open space for a desirable living environment, the landscape sets the stage for a wide variety of interesting tourist attractions....

"The most important mineral resource is coal which has dominated the economic structure for half a century. The coal is medium to high grade of early (Pottsville) Pennsylvania age and occurs in moderate to thick nearly horizontal seams at intervals in elevation..... The coal industry will employ a large sector of the labor force at reasonable wages for many years......*/

"The most immediate promise of industrial development related to a natural resource lies in the Districts' forests. While no virgin timber remains, good management, the Jefferson National Forest, and extensive areas protected by mineral rights have provided an abundant existing timber resource....

"The resource, together with available low-cost labor with at least limited woodworking experience, makes timber production the most likely quick return potential. Good transportation for exporting timber or timber products exists in the arterial highway system and the extensive rail network....

"Limestone and dolomite are abundant in the District, but the lack of large local markets has limited production potential. There are several quarries producing construction and cement grade stone in limited quantities.... Increases in the construction industries within the District and in nearby areas could enhance local stone production and provide employment for low-skilled or easily trained skilled workers.....

"Oil exploration has been conducted off and on since 1910 with the greatest activity in Lee County. Not until recently have sufficient quantities to generate real optimism been found. In April 1967, a self-pumping well was capped which

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^{*/} Chemical and Engineering News (June 12, 1967) reported 4 pilot plants for production of petroleum products and basic chemicals from coal, and several new deep-shaft mines are being opened in the region.

is producing 42 barrels per hour of fine grade Pennsylvania crude...."*/

".... the soils and climate are suitable for many truck farm and vegetable products."

Among the industry divisions, mining and agriculture provide most of the employment in the area, with mining providing most of the value added. Comparative totals for Dickenson, Lee, Scott, and Wise Counties and the City of Norton are as follows:

Value added in mining (1963)	\$48,525,000
Value of farm products sold (1964)	8,698,000
Value added by manufacture (1965)	1,053,000

Local Agencies --

"Regional agencies include only the District Organization responsible for regional planning in addition to its District economic development duties.

"County agencies include three county planning Commissions; the oldest was organized about two years ago in Lee County. None of the Commissions are very active but still meet regularly attempting to determine direction....

"Each county provides an industrial development organization capable of developing land, owning buildings, and otherwise materially and financially aiding prospective industry and the county governments. These, too, are new and their specific powers and responsibilities must be learned as time goes on. The OEDP is an important step in giving them direction. They will be deep in its implementation....

"All the counties provide some police protection through the Sheriff's Department but State Police handle the larger burden.....

"Municipal agencies include a fairly broad range from police departments to Planning Commissions....***

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^{*/} Lenowisco Overall Economic Development Program (May 1967), pp. C-27 to C-32.

^{**/} Op. cit., p. C-20.

^{***/} Op. cit., pp. C-33 to C-35.

"In the primary-secondary range, schools are all county operated except those in Norton operated by the city. In terms of pupil-teacher ratios, the District compares favorably with the State, great improvements having been made in recent years....

"The area contains one junior college soon to become a four-year university (in 1967). Clinch Valley College in Wise County enrolls 426 students; the 1967 freshman class can enter a four-year curriculum.

"Vocational training schools in all three counties enroll 1,176 students with the distribution strongly weighted toward Wise County which has the oldest program...."*/

A two-year community college has been proposed for the area, which is identified as Region 14 in the Virginia Community College System.**/

Problems --

"The age of workers in the labor force is a serious marketing problem. Members of the population segment 20-34 who have migrated in large numbers for lack of opportunity leave behind persons who almost certainly represent a lower degree of abilities and skills than those who have left....

"The level of education, training, and skills of the unemployed and underemployed is relatively low compared to persons of similar age in other labor market areas in the United States. The situation prevails among women as well as men.

"An important defect resulting from long-standing chronic underemployment is a poor attitude toward retraining or other risk-taking to improve individual position. Lack of strong worker pride is one of the greatest problems to be overcome ***/

The problem of identifying several thousand males of working age who were not reported in the labor force in the 1960 Census is being studied in one of the State's Appalachian research projects (see below).

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^{*/} Op. cit., pp. C-10 and C-11.

 $[\]frac{**}{1967}$. Virginia Department of Community Colleges, release of July 1, 1967.

^{***/} Lenowisco, op. cit., pp. C-3 and C-5.

Health problems include a high incidence of tuberculosis among area residents, especially in Lee County, as well as serious shortages in the numbers of practicing physicians and dentists and active registered nurses (see Appendix Table 4). Another Appalachian research project is designed to provide a suggested program of comprehensive health services for the entire southwestern portion of the State (see below).

"Where the labor force has few skills and a low level of education, their willingness to work and to retrain for a new job is essential. The public assistance and unemployment compensation programs reduce their willingness and ability to do either. The extra initiative required on the part of the labor force in adjusting to a more industrialized economy is harder to generate among persons on public assistance. There is a strong sense of security built on such programs. As indicated by excessively high percentages of local taxes spent for public assistance, they also drain tax money needed for growth....

".... even with declines in population there is virtually full occupancy of existing sound housing units, and no construction of any importance taking place.

"The real estate market reflects this in prices that are as high or higher in the more attractive towns than in the Washington metropolitan area. The unbelievable real estate values reflect in-migration from the countryside to the towns, lack of competition in the market, the effects of growth starvation on the market, the availability of municipal services, and other less important related factors.....

"Almost all the communities lack sufficient fire and police protection, which makes the urban environment less desirable for growth. This problem is again a combination of financial difficulty and attitudes. The provision of other municipal services, parks, playgrounds, cultural opportunities, eating places, municipal buildings, and the like, are at a very low level....

"A number of causes have resulted in an almost complete lack of desirable available development land within the municipalities. Some major causes have been:

- a. <u>Lack of planning</u>, municipal, county, and regional -- physical and economic.
 - b. Waste of urban spaces.
 - c. Difficult topography.

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- d. Misuse of flood plain areas.
- e. Lack of growth-oriented laws and ordinances.
- f. Lack of economic stimulus for redevelopment efforts in the communities.

"In general, the problems of appearance....are signs of poor maintenance, upkeep, and lack of personal pride in property. In addition, there seems to be a low consciousness of civic improvement and incentive within the individual communities. For example: (1) unpainted houses; (2) trash in yards; (3) dirty streets; (4) disregard for yard maintenance and attractiveness, and (5) disregard for attrativeness and dignity of public buildings and lands; (6) disregard for preservation of the natural beauty of the area.

"While these problems are solvable with a minimum of financing and planning effort, the attitude changes necessary to achieve widespread results are stupendous.....

"As a result of the large number of small communities and general dispersion of population, municipal governments find it difficult to command the talents and popular support to function as urban governments.....

"..... Indoor recreation, both public-owned and commercial, are seriously underdeveloped and an immediate market exists in almost every community.

"..... Even with sharp declines in mining employment it is still the major wage-producing industry. Mechanization requires less labor per ton each year but more highly skilled personnel. Even with major unemployment among coal miners, the industry has some difficulty filling certain positions.

..... Training in the critical mine skills could employ several persons if proper liaison with the industry were established.....

"Mining employment, while paying relatively high wages, has become less and less attractive to youth; the average mine worker is now over 45.....

"Agriculture is the second most important employer. Though it employs more persons, total income is substantially lower than mining. Average farm sizes in 1965 were about one-half the State's, and only burley tobacco and livestock produced large revenues.

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..... Many farms are of the subsistence type supplying at least 51 percent of food and shelter for the management without producing a supporting cash income.....

"One of the reasons that a wide variety of products are not grown is the inaccessibility of the markets for the products of small farms. This would indicate that there is a definite need for packers, canners, processors, and wholesale marketing activity complementary to the agricultural industry. A potential for these exists if grower contracts, buildings, and operators are secured.

"A comparison of retail buying power against retail sales....shows a substantial loss of retail spending per year during the period 1960-1965....the outspending is likely taking place largely at Kingsport, Tennessee, Bristol, Tennessee-Virginia, and Middlesboro, Kentucky; these being the only superior competitive trade areas nearby.....

"Problems thought to contribute to trade difficulties are:

- a. Poor physical growth of trade centers;
- $\begin{tabular}{ll} \textbf{b.} & \textbf{Inadequate inter-community transportation} \\ \textbf{and communication;} \end{tabular}$
- c. Statistical unattractiveness to outside business investment;
 - d. Lack of confidence in economy at local level;
- e. Widespread lack of business abilities and skills;
 - f. Population dispersion -- market decentralization;
- g. Superior growth of competitive areas outside district.

"Secondary roads pose a problem in that the mileage is great per taxable unit served. This necessarily cuts down on maintenance funds. A system for selection improvement based, at least in part, on economic benefit is necessary. Once some economic improvement is secured, more equally distributed expenditure of maintenance funds should be restored.....

"Industries using large amounts of water cannot at this time forsee existing supplies sufficient for present or future

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needs. Many communities lack central water systems or the financial ability to expand present systems for large scale industrial or residential developments. Therefore, it is difficult to promote immediate industrial development or extensive residential development within the communities. No truly 'wet' industry could be accommodated anywhere at present....

"The systems for passing and enforcing growth-oriented laws and ordinances are lacking. What ordinances and where they are passed must be carefully thought out to be consistent with regional, county, and municipal plans. They may include any or all of the following:

- a. Trash Ordinances
- b. Health Ordinances
- c. Building Codes
- d. Subdivision Codes
- e. Traffic Control, where applicable
- f. Flood Damage Prevention Ordinances
- g. Junkyard and other very simple land use control ordinances.

".....Public finance in the District needs a great deal of attention if the area is to progress. The one county bond rating on which we have information is low and it is believed that the credit rating of the other counties and their towns is equally poor. There is generally an inadequate tax base and collection of property taxes has continued to be in areas. In fiscal year 1963, over 10 percent of all property taxes were delinquent on the average...."*/

<u>Program</u> -- Perhaps the most important part of the Lenowisco program is the following Statement of Overall Goal:

" 'Development of a Self-Sustaining Economy Which Provides for Its Members an Acceptable Standard of Living.'

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^{*/} Op. cit., C-7 to C-21, C-23 to C-26, and C-36.

"To accomplish this either the population must be reduced to the level the present economy will support, or the economy expanded to achieve the proper standard of living for the present inhabitants -- or both.

"It is adopted as the purpose of this strategy to provide for the present inhabitants a suitable standard of living."*/

The program includes five major projects and a continuing campaign to sustain the entire operation. Project Number 1, designated EDC-1, is the Duffield Industrial Center.

"The first phase of the project is an engineering feasibility and preliminary land planning study intended to insure the development potential and set the direction for the next development phase.....

"From this point development will begin incremental stages, the first as a pilot project to prove the conclusions drawn in the strategy. The planning, however, must be complete enough that decisions on the first increment are coordinated with ultimate development of the planning unit.

"Industrial solicitation will begin as soon as the feasibility and planning study is done with final negotiations occurring as soon as utilities and financial arrangements have been assured."**/

Project Number 2, designated EDC-2, is the Big Stone Gap-Powell Valley Trade Center.

"The first stage will consist of comprehensive physical planning for the remainder of the projects in this area. It is expected the Tennessee Valley Authority will make most of the planning study with local authorities in conjunction with flood control project studies now being made.

"This project is an attempt to make the most of the opportunity afforded by the need for flood relief to make Big Stone Gap an example for other redevelopment efforts.....

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^{*/} Op. cit., p. D-1.

^{**/} Op. cit., p. G-14.

"Stage 2 involves the physical redevelopment of the downtown area, some housing developments, and the flood control construction and any others which the comprehensive plan may show to be feasible at this time. Utility extensions to whatever developments may take place out of town may be made at this time.

"Stage 3 is an extension of Stage 2 after some economic stimulation efforts by the town to improve the living environment, the cultural, social, and recreational opportunities.

"The regional shopping center will occur by private enterprise in a properly planned location determined from relocated U.S. 23. Some help may be needed for utilities, but the site acquisition will be made and the buildings built by private enterprise. Some promotion and additional market studies may be necessary."*

Project Number 3 is the Norton Downtown Redevelopment and the Wholesale Center.

"Stage I would consist of a comprehensive plan for the City of Norton including site selections for increased wholesaling, supply, and distribution functions. The State of Virginia and Lenowisco, together with whatever other help may be commandeered, will undertake the plan. A separate, more detailed plan should be made for downtown rehabilitation and the local forces necessary to carry it out mustered.

"Stage 2 would consist of downtown rehabilitation construction and development of one or more industrial sites for the wholesaling operation. Access roads may have to be provided, depending on the alignment of improved U. S. 23. Additional utility extensions may be necessary. Part of the plan and subsequent construction could alleviate moderate flood conditions if proved feasible."**/

Project Number 4 is the Timber Concentration Yard.

"The necessary studies and recommendations have been made to undertake construction of the yard as soon as a

^{*/} Op. cit., p. G-16.

^{**/} Op. cit., p. G-16.

site is selected. Lenowisco's Forestry Committee will undertake to select the site and find an owner-operator for the yard.

"A business loan may be necessary for initial construction, but the yard should be immediately self-supporting and would employ 75 or 100 persons.

Project Number 5 is the Tourist Network Development.

"Stage l of this project consists of a study to determine and authenticate the significant historical areas of the District. Simultaneously, an area-wide organization to control, coordinate, and promote tourism throughout the area will be formed. The LENOWISCO Recreation and Travel Committee has already received a proposal for this undertaking which they have adopted.

"Stage 2 will involve assembling the capital and operators to develop the network while getting quality control measures passed in the three counties.

"There will be a development plan prepared by the control organization and the results should show several other necessary projects." $\pm \frac{1}{2}$

The sustaining campaign concerns attitudes, confidence, and cooperation.

"There is no part of the program which can take place without a continuing effort to involve the people, their leaders and their governments, in implementing the stragegy. As an example, EDC-1 will require monies from all three county governments to make the purchase of lands now under

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^{*/} Op. cit., p. G-16.

^{**/} Op. cit., p. G-17.

option by the Scott County Industrial Development Board. This means that the program, and indeed the very idea of progress and change, must be sold both to the governments --local, state and federal -- and to the people.

"The attitude program consists of leadership education. Its purposes are to gain understanding and support for the economic development program with sufficient conviction to pass the test of problem solving. Our program is an ambitious one and, because it is ambitious, it has extra problems built in. The success of the strategy depends on how much of the capabilities of 95,000 people, their time, talent, and effort can be massed into an efficient, planned thrust....

"The public relations program is a continuing process and must be undertaken by the leadership available within the community. These leaders must take the approved OEDP and learn it well enough to be able to associate the day to day decisions they face with its guidelines."

After publication of the OEDP, personal contacts made by the organizations and people who will implement the program will continue to carry out the public relations effort. In addition to this, newspaper, magazine, television and radio resources will be employed either in promoting the program or in promoting particular projects within its framework. Attempts will be made to have the program adopted or accepted by all the following organizations:

- 1. Planning Commissions
- 2. Industrial Development Commissions (county and municipal)
- 3. Related Federal Agencies
- 4. Municipal Governments
- 5. Chambers of Commerce
- 6. Retail Merchants Associations
- 7. Labor Unions

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- 8. Management Associations
- 9. Other Social, Religious and Philanthropic Associations

"An organization with a thorough understanding of the program and controlling the liaison between the participating jurisdictions necessary to carry it out, must spearhead the public relations program. At present, this job should be handled by the district organization. As indicated, it should begin immediately with promotion of the Overall Economic Development Program.

"Attitudes, communication, and confidence in the economic unit are involved in every element of the program and are to be hereafter considered as part of the implementation process for all other projects."*

This southwestern section of Virginia shares with other parts of Central Appalachia persistent problems of declining employment, outmigration, and population dispersion. Current ARC-HUD research is expected to shed light on causes and practicable solutions of these problems. As we have seen, the section has major economic assets that can contribute to industrial development: a larger supply of potential labor than any other Virginia Appalachian growth area, plentiful supplies of limestone and dolomite for a well-developed quarry industry, petroleum fields under current development, soil and climate suitable for fruit and vegetable production and growing urban markets nearby. Coal production, already increasing at 5 percent annually, may accelerate further to supply raw material for basic chemical production. The greatly improved highways (now under construction) will facilitate recreation and tourism as well as access to materials and markets. The new State university should be attractive to many of the growth industries that emphasize research and higher education.

The employment multiplier for Wise County and the City of Norton indicates that, for every increase in basic employment, there is likely to be an equal increase in supporting employment for the growth center (see Appendix Table 11). The entire growth area now has a broadly supported development organization with a well-conceived strategy to promote the growth of both basic and supporting employment.

Bristol-Abingdon Area

The Bristol-Abingdon growth area has the second largest population and fourth largest potential labor supply among those with growth centers in the State (see Appendix Tables 9 and 10). The total population

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^{*/} Op. cit., pp. D-22 to D-24.

increased at an average annual rate of 0.9 percent in the 1950's, and this is expected to accelerate in the 1960's. (The Virginia Planning Division projected population in the Washington-Bristol metropolitan area to increase at an average annual rate of 1.5 percent from 1965 to 1970 - see Appendix Table 12). Its growth center extends from Bristol, Tennessee and Virginia, to Abingdon along Interstate Highway 81.

The Washington County and Bristol, Tennessee-Virginia, area's per capita 1963 receipts from selected services and wholesaling were about nine-tenths of the national average, and per capita retail sales were slightly above it. About 30 percent of 1966 employment was in Manufacturing, 15 percent each in Agriculture and Trade, and 10 percent in Service industries; the average rate of unemployment was 3.8 percent.

There are 36 manufacturing establishments with 50 or more employees in the Bristol-to-Abingdon growth center: 8 with employment of 50 to 99, 16 with 100 to 249, 8 with 250 to 499, 1 with 500 to 999, and 3 with 1,000 or more. The total employment in these establishments in 1966 was about 10,300. Seven each of these plants are in the apparel and food products industries, 5 in fabricated metals, 4 in wood products, 3 in electrical machinery, 2 each in non-electrical machinery, paper, textiles, and transportation equipment, and 1 each in chemicals and printing and publishing. The local employment multiplier for Bristol is 2.5, and that for Washington County is 2.2 (see Appendix Table 11).

The area contains an air carrier airport (about 15 miles southwest of Bristol), which offers commercial service via 3 airlines, and a general service airport (near Abingdon) with a paved runway 2,800 feet long. It is served by 2 Class I railroads and has good highway access to the east and northeast via Interstate Highway 81. Completion of Interstate 81 to the southwest of the area and of Appalachian Development Highway Corridors A and B will provide rapid highway movement to the north, west and south within a few years.

There are two 4-year liberal arts colleges and two junior women's colleges in this growth area, as well as a vocational-technical school which is being converted to a community college. There are two public libraries with total holdings of approximately 40,000. The Barter Theater at Abingdon offers a full repertory of plays, and many concerts and lectures at the four colleges are open to the public.

Three general care hospitals are located in the Bristol-Abingdon growth center, with a combined patient capacity of 380 beds and an NLN-approved school of nursing. Additional facilities are under construction to provide 81 more general care and 80 extended care beds.

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Treated water is supplied to the cities of Bristol by a system with a design capacity of 5,000,000 gallons per day and average daily use of 4,000,000. Abingdon and several nearby communities are supplied by a district system with a design capacity of 3,200,000 and average daily use of 1,200,000 gallons per day. The sewage system for the Bristol cities provides secondary treatment and chlorination with a design population of 75,000 and equivalent connected population of 65,000. The Abingdon system provides primary and chlorination treatment with a design population of 8,000 and connected population of 4,000. Two upstream detention reservoirs have substantially reduced the flood hazards that used to plague the Bristol cities.

There are 2 industrial parks in this growth center: one is on a 400-acre tract east of Abingdon, about 4 miles from an interchange on Interstate Highway 81, with access road, power line, city water line, 500,000-gallon reservoir, natural gas line and rail led track completed and an industrial sewage lagoon being planned; the other is on a 200-acre tract north of Bristol, about 2 miles from an Interstate 81 interchange, adjacent to a rail main line, with an access road, power line, city and sewer lines, and natural gas distribution line being planned. Options have been obtained on 884 acres for a third, and larger industrial park 13 miles south of Bristol.

Washington County and Bristol, Virginia, have recently joined the Tennessee-Virginia Economic Development District and are preparing applications for Appalachian and EDA grants to supplement State and local funds for access roads and water and sewer facilities for 2 of the industrial parks referred to above. Cooperative development planning and promotion, between competing industries and across local and state boundaries, is much in evidence in the Bristol-Abingdon growth area and is expected to contribute markedly to a further acceleration in its rate of growth. The current efforts to develop new industrial sites reflect a sound graps of the problems that must be solved if development is to continue.

Lebanon-Bluefield Area

The Lebanon-Bluefield growth area has the third largest potential labor supply among those with growth centers in the State (see Appendix Table 10). The total population decreased at an average annual rate of 0.5 percent in the 1950's (see Appendix Table 9), but leveled off in the early 1960's and is projected to increase at about 1 percent annually from 1965 to 1970 (see Appendix Table 12). Its growth center extends from Lebanon along Highway 19 through Richlands, Tazewell, and Bluefield, Virginia and West Virginia along Highway 460.

Per capita retail and wholesale sales in Tazewell County and Bluefield, West Virginia, were about the same as the national average in

1963, and per capita receipts from selected services were about 10 percent above it. All three measures were relatively low in Russell County.

In 1960, about 23 percent of the workers in Russell County and 30 percent of those in Tazewell County worked outside the county, most of these in coal mines in adjacent areas of Virginia and West Virginia (see Appendix Table 14).

In 1966, Agriculture and Mining were the dominant industry divisions in Russell County, whereas in Tazewell County they were Manufacturing and Trade. The average rates of unemployment were 6.0 and 5.2 percent of the labor force (see Appendix Table 16). Value added by manufacture was about \$2 million in Russell County and about \$13 million in Tazewell County in 1963; the value of farm products sold in 1964 was about \$5 million and \$3 million respectively (see Appendix Table 15).

There are 34 manufacturing establishments with 20 or more employees in the Lebanon-Bluefield growth center: 8 with employment of 20 to 49, 15 with 50 to 99, 8 with 100 to 249, 2 with 250 to 499, and 1 with 500 to 999. Nine of these plants are in the food products industry, 6 in non-electric machinery, 5 in electric machinery, 4 in lumber and wood products, 3 in apparel, 2 each in furniture and stone or clay products, and 1 each in textiles, printing and publishing, and miscellaneous manufacturing. The local employment multiplier for Tazewell County is 2.1 (see Appendix Table 11).

The area is served by an air carrier airport (a few miles north of Bluefield, West Virginia) which offers commercial service via one airline, and a general service airport (near Richlands) with a 2,000-foot paved runway. A Class I railroad serves 3 of the 4 towns in the growth center. Rapid east-west highway movement will be available on the completion of Appalachian Development Highway Corridor Q, and north-south by Interstate Highway 77, both being presently under construction.

A 4-year state college, a private junior college, and 3 private business colleges are located in this growth center, and a new community college is under construction. There are two public libraries with total holdings of approximately 45,000.

There are 6 general care hospitals in the growth center, with a total patient capacity of 594 beds. Treated water is supplied at Bluefield, Virginia, by a system with design capacity of 1,500,000 gallons per day and average daily use of 525,000, at Richlands and Tazewell by systems with design capacities of 1,000,000 and average daily use of 500,000 each, and at Lebanon with design capacity of 200,000 and average daily use of 150,000. The jointly owned and

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operated sewage system for Bluefield, Virginia and West Virginia, provides secondary treatment with chlorination for a design population of 75,000 and equivalent connected populations of 5,500 and 1,500, respectively; the plant at Richlands provides primary treatment for a design population of 6,500 and a connected equivalent of 4,300. A watershed protection and flood prevention project is under way to reduce the flood hazards at the Town of Tazewell through the construction of 2 multiple-purpose and 2 flood-water-retarding dams on nearby streams.

Total personal income increased by 17 percent in Buchanan County, 15 percent in Russell County, and 25 percent in Tazewell County from 1960 to 1965 (see Appendix Table 17).

The main problem likely to impede the future development of the Lebanon-Bluefield growth area is the lack of comprehensive development planning to identify the special problems of local communities and establish phased programs of investments in needed facilities. The State and localities are already moving rapidly to upgrade the major resource of the area, its labor supply, through improved school facilities and teacher training, the establishment of vocational high schools in the several counties, and the location of a community college near the center of the growth area. The Russell County section seems to be well advised to accelerate the growth of industrial activity on its well-established agricultural, mining, and services bases, and the Tazewell County section should move toward upgrading a well begun manufacturing base and promoting the growth of trade and service establishments. However, there is no substitute for local inputs of information on needed projects and priorities, and little ean be accomplished without cooperative local support.

As a continuation of the efforts and programs mentioned above to utilize the potentials of the area and establish programs suited to its needs and problems, we are recommending the establishment of a vocational high school in Russell County. In addition, we are recommending establishment of educational television network to serve all the counties of southwest Virginia.

The programs we are recommending here are a continuation of our program for this growth area last year which consisted of a vocational high school, a public library and an area community college.

We believe that such a program will truely tap the labor force potential and upgrade it to improve the industrial structure of the area as a whole and thereby its total economic base.

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Marion-Wytheville Area

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The Marion-Wytheville growth area consists of Bland, Smyth, and Wythe Counties. Its population decreased at an average annual rate of 0.2 percent in the 1950's (see Appendix Table 9), but leveled off in the early 1960's and is projected to increase at about 1.2 percent annually from 1965 to 1970 (see Appendix Table 12). Its growth center extends from Marion to Wytheville along Interstate Highway 81.

Per capita retail sales in Smyth and Wythe Counties were about 65 percent and 80 percent of the national average, respectively, in 1963. Per capita wholesale sales and receipts from selected services were considerably below the national average, as were all 3 measures in Bland County.

In 1960, about 21 percent of the workers residing in Bland County worked outside the county, as did 18 percent of those in Wythe County. Only 5 percent of Smyth County's workers commuted to jobs outside the county, and were outnumbered by in-commuters more than 2 to 1 (see Appendix Table 14).

In 1966, the Manufacturing industry division accounted for about 40 percent of employment in Bland and Smyth Counties and about 20 percent in Wythe County. Agriculture was the second largest division in Bland and Wythe Counties, whereas Trade held that rank in Smyth County (see Appendix Table 16). The average rate of unemployment was 3.6 percent in Bland County, 5.8 percent in Smyth County, and 2.7 percent in Wythe County, compared with 3.3, 6.9, and 7.9 percent, respectively in 1960. Value added by manufacture in the growth area totaled about \$54 million in 1963 and value of farm products about \$10 million in 1964 (see Appendix Table 15).

There are 20 manufacturing establishments with 20 or more employees in the Marion-Wytheville growth center: 5 with 20 to 49 employees; 9 with 100 to 249, 5 with 250 to 499, and 1 with 500 to 999. Eight of these are in the apparel industry, 3 in textiles, 2 each in furniture, fabricated metals, and wood products, and 1 each in food products, stone, clay, and glass products, and miscellaneous manufacturing. The local employment multiplier for Smyth County is 2.1, and that for Wythe County is 1.9 (see Appendix Table 11).

The growth center contains a general aviation airport with a 3,000-foot paved runway about halfway between Marion and Wytheville. (The nearest air carrier airport is about 25 miles from the eastern end of the center.) A Class I railroad and an interstate highway run the full length of the growth center.

The center contains a State community college, which offers 2-year programs in the arts and sciences and technical subjects, and 2 public libraries with total holdings of 59,000.

There are 4 general care hospitals in the growth center, with a total patient capacity of 170 beds, and a new facility is under construction to add 115 new beds. There is also a large regional hospital for mental illness, 4 nursing homes, and a dental health clinic.

Treated water is supplied at Marion by a system with design capacity of 2,000,000 gallons per day and average daily use of 1,000,000, at Rural Retreat with capacity of 500,000 and average daily use of 65,000, and at Wytheville with capacity of 2,000,000 and average daily use of 1,500,000 gallons per day. The sewer systems provide secondary treatment with chlorination for design populations of 12,500 and 1,500, respectively, at Marion and Rural Retreat, with a connected equivalent of 10,000 at Marion. The Wytheville system provides primary treatment with chlorination for a design population of 10,000 and a connected equivalent of 8,000.

Available industrial sites in the growth center with treated water and sewer facilities and natural gas available include one of about 70 acres a few miles east of Marion, and one of 45 and another of 30 acres at Rural Retreat. All are within 1 or 2 miles of an interchange on Interstate 81, and 2 have access to rail sidings.

There are local planning commissions for Marion and Wytheville, and both towns have adopted zoning and subdivision ordinances.

The substantial volume of retail sales in the growth center is an indication of predominance as a service center for this area. Once a viable service center is started, other economic ties from the hinterland become strengthened with the center of the area. A new interstate highway is open for traffic through the entire length of the growth center. Additional public facilities planned or under construction there include 2 vocational high schools, a community college library, 2 community hospitals, and a county public health center.

Total personal income increased by 24 percent in Bland, 13 percent in Smyth, and 43 percent in Wythe Counties from 1960 to 1965 (see Appendix Table 17), an average increase of 24 percent for this growth area.

Galax-Hillsville Area

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The Galax-Hillsville growth area consists of Carroll and Grayson Counties, the independent city of Galax, and part of Floyd County. Its population decreased at an average annual rate of 0.5 percent in the 1950's (see Appendix Table 9), but leveled off in the early 1960's and is projected to increase at about 1.8 percent annually from 1965 to 1970 (see Appendix Table 12). Its growth center extends from Galax to

Hillsville along Highway 58, and will be intersected by Interstate 77 by 1975.

Per capita retail sales in Carroll and Grayson Counties and the city of Galax were about 60 percent of the national average in 1963. Per capita wholesale sales and receipts from selected services were comparatively much lower, as were all 3 measures in Floyd County.

In 1960, about 12.5 percent of the workers residing in Carroll and Grayson Counties and the city of Galax worked outside of that area, and 32 percent of those in Floyd County worked outside the county (see Appendix Table 14).

Nearly half of the total employment in the Carroll-Grayson-Galax area in 1966 was in Manufacturing, and about one-sixth was in Agriculture, whereas slightly over one-fourth of the employment in Floyd County was in each of these industry divisions. The average rates of unemployment in the 2 areas were 4.7 and 4.3, respectively (see Appendix Table 16). Value added by manufacture in the growth area totaled about \$34 million in 1963, and the value of farm products sold about \$11 million in 1964 (see Appendix Table 15).

There are 23 manufacturing establishments in the Galax-Hillsville growth center: 4 with employment of 20 to 49, 8 with 50 to 99, 4 with 100 to 249, 5 with 250 to 499, and 2 with 500 to 999. The total employment in these plants was about 4,500 in 1966. Eight of them are in the apparel industry, 6 in furniture, 2 each in electrical machinery, glass products, and textiles, and 1 each in food, lumber, and printing and publishing. The local employment multiplier is 1.7 for the Carroll-Grayson-Galax area and 1.5 for Floyd County (see Appendix Table 11).

A general service airport is under construction at the eastern end of the growth center and is expected to be open for traffic in 1967 with a 3,400-foot paved runway. (The nearest air carrier airport is about 35 miles from there.) The western end of the growth center is served by a Class I railroad, and the center will be bisected by an interstate highway now under construction.

The center is served by a State community college at Wytheville, about 40 to 60 minutes highway driving time away (to be reduced somewhat on completion of Interstate Highway 77). There is a public library in Galax with holdings of 8,300, a school library in Hillsville is open to the public.

There are 2 general care hospitals in the growth center with 104 general care beds and 30 for chronic disease cases.

Treated water is supplied to the city of Galax by a system with a design capacity of 2,000,000 gallons per day and average daily use of 1,000,000. The Hillsville system has a design capacity of 800,000 and average daily use of 300,000 gallons. The Galax sewage system provides primary treatment with chlorination with a design population of 11,000 and a connected equivalent population of 8,500. The Hillsville sewage system provides secondary treatment with chlorination for a design population of 2,000, with a connected equivalent of the same amount; plans have been approved for a second plant with a design population of 1,500.

A pumped-storage hydro-electric facility is being planned on the New River which will provide a large water impoundment a few miles west of the growth center. Industrial sites suitable for light industry with access to treated water and sewer lines include 2 in Galax and one near Hillsville. They are located on arterial highways about 5 or 6 miles from a planned interchange on an interstate highway which is now under construction.

Total personal income increased by 53 percent in Carroll County and 37 percent in Grayson County from 1960 to 1965, but declined by 9 percent in the city of Galax (see Appendix Table 17).

Local planning commissions have been established in Galax and in Grayson County, and another was formed recently in Carroll County. The city of Galax has adopted subdivision and zoning ordinances.

The Galax-Hillsville growth area has a record of effective cooperation among the localities in the promotion of industrial financing and public recreation projects. Comprehensive planning is being developed for the area by the Galax-Carroll-Grayson Chamber of Commerce, whose staff is presently concerned with the problem of appropriate geographical boundaries for a local development district.

After completion of the new airport and sewage treatment plant at Hillsville, longer range projects would seem to be in order. Vocational high school facilities are under construction in Carroll and Grayson Counties, the former in conjunction with a consolidated high school; and applications are being prepared for NDEA demonstration equipment and educational television facilities. A likely related project would be a public library for Carroll County. With a well-established manufacturing base and numerous tourist attractions already funded, an early expansion of trade and service facilities seems to be indicated.

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Pulaski-Narrows Area

The Pulaski-Narrows growth area consists of Giles and Pulaski Counties in the Appalachian Region plus the independent city of Radford and most of Montgomery County. Its population increased at an average annual rate of 0.2 percent in the 1950's (see Appendix Table 9), and this is projected to accelerate to about 2.5 percent annually from 1965 to 1970 (see Appendix Table 12). Its growth center extends from Pulaski through Dublin, Radford, and Christiansburg along Interstate Highway 81 and through Blacksburg, Pembroke, Pearisburg, and Narrows along Appalachian Development Highway Corridor Q.

Per capita retail sales and receipts from selected services in the Pulaski-Montgomery-Radford area were about 78 percent and 54 percent of the national average, respectively, in 1963. Per capita retail sales in Giles County were about 88 percent of the national average, whereas per capita services receipts were a small fraction of it, as were per capita wholesale sales in both areas.

In 1960, a little over 10 percent of the workers residing in Giles County and in the Montgomery-Radford area worked outside the county, whereas over 20 percent commuted out from Pulaski County. Twice as many workers were commuting in to Giles County as commuting out to work, most of them from adjacent counties in West Virginia (see Appendix Table 14).

In 1966, the Manufacturing industry division accounted for more than half of the total employment in Giles County, compared with about 40 percent in the Pulaski-Montgomery-Radford area. About 10 percent were employed in Trade, 5 percent in Services, and 4 percent in Agriculture in both areas, and the average unemployment was about 2 percent of the labor forces (see Appendix Table 16). Montgomery County produced about one-half of the farm products sold in this growth area (see Appendix Table 15).

There are 33 manufacturing establishments with 50 or more employees in the Pulaski-Narrows growth center: 7 with 50 to 99 employees, 9 with 100 to 249, 8 with 250 to 499, 5 with 500 to 999, and 4 with 1,000 or more. There are 7 each in the apparel and textile industry groups, 4 in chemicals, 3 each in furniture and electrical machinery, 2 in food products, and 1 each in wood, paper, rubber, leather, glass, and fabricated metal products and in primary metals. Both Giles and Pulaski Counties have employment multipliers of 2, as does the city of Radford (see Appendix Table 11).

The growth center contains an air carrier local service airport and is served by a Class I railroad through two-thirds of its length. About half of it lies along an interstate highway, and the remainder along an Appalachian development highway.

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There are 3 State-supported institutions of higher education in the growth center: (1) the State's land-grant university, with graduate programs leading to the Master's Degree in 53 disciplines and to the Doctor of Philosophy Degree in 26; (2) a women's college with graduate programs leading to the Master's Degree in 10 disciplines; and (3) a community college with 2-year programs in the arts and sciences of practical nursing. There are 2 town libraries, a county library, and a regional public library in the center, with total holdings of 85,400, in addition to the university library with 400,000 volumes and 3,600 periodicals.

There are 4 general care hospitals with a total patient capacity of about 350 beds in the growth center, as well as a psychiatric hospital with 145 beds.

The water-supply and sewage systems have the following specifications:

	Water Capacity	Av. Daily Use	Sewage Capacity	Connected Population	Method of Treatment
Pulaski	3,000,000	1,000,000	20,000	10,000	Secondary
Dublin	3,000,000	1,000,000	2,000	1,650	Secondary
Radford	4,000,000	2,000,000	20,400	9,500	Primary
Christiansburg	2 000 000	2 000 000	8,400	6,000	Secondary
Blacksburg	3,000,000	2,000,000	22,000	17,200	Secondary
Pearisburg	518,000	250,000	3,000	2,800	Primary
Narrows	350,000	200,000	6,000	6,000	Primary

About 15 industrial sites are available in the growth center, varying in size from 20 to 1,800 acres. All have railroad tracks, either on or adjacent to them, electric power up to 33 KV if needed, and an air carrier airport within 25 miles. Most have access to treated water and sewer facilities and access roads connecting with interstate or development highways. Nine of them (including the largest site) are adjacent to the New River downstream from the Claytor Lake recreational area, and are thus well adapted for the location of heavy water-using industries, whether for cooling, processing, or discharge of effluents. (The State Division of Water Resources reports that the New River has great assimilative capacity.) Four multiple-purpose and 2 floodwater retarding dams are planned for construction

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upstream from the town of Pulaski for flood prevention and water quality control. A multiple-purpose dam is proposed upstream from Pembroke and 1 multiple-purpose and 1 floodwater retarding dam upstream from Narrows.*/

The following table shows much recent progress in local planning:

Planning Commission Formed	Zoning Ordi- nance	Subdi- vision Ordin.	Land Use Plan
x		x	
x		x	x
x	x	x	x
x	x	x	
x	x	x	
x	x	x	x
x	x	x	
x	x		
	Commission Formed x x x x x x	Commission Ordi- Formed nance x x x x x x x x x x x x x x x x x	Commission Formed Ordin-nance vision Ordin. x x x x x x x x x x x x x x x x x x x x x x x x x x x x x x

The New River Valley Industrial Commission, established in 1962, serves Giles, Montgomery, and Pulaski Counties and the independent city of Radford. It has successfully promoted industrial development (total employment in the growth area increased at an average of 4.2 percent annually from 1960 to 1966) and is currently considering the employment of a full-time research staff to undertake comprehensive development planning on a continuing basis. Likely problems for early staff consideration include housing development, labor recruitment, utility expansion, and others associated with rapid growth. Longerrange planning should deal with problems of transition from defenserelated employment (now over one-third of total manufacturing employment) and with promotion of expanded trade and service facilities.

Buchanan-Roanoke Area

The Buchanan-Roanoke growth area consists of Botetourt and Roanoke Counties, the independent city of Roanoke, and parts of Bedford, Floyd, Franklin, and Montgomery Counties. Its population increased at an average annual rate of 1.5 percent in the 1950's (see Appendix

^{*/} ERS, FS, SCS-USDA, <u>Upper New River Sub-Basin</u>, <u>Kanawha Basin</u> <u>Comprehensive Study</u>.

Table 9), and is projected to accelerate to more than 2 percent annually in the 1960's (see Appendix Tables 12 and 18). Its growth center extends from Roanoke and Salem to Buchanan and Eagle Rock along Highway 220 and Interstate 81.

In 1960, about 40 percent of the workers residing in Botetourt County commuted to jobs outside the County, mostly to Roanoke County and City. Only about 4 percent of those in Roanoke County and City commuted outside the County, and they were out-numbered by more than twice their number of in-commuters (see Appendix Table 14).

Per capita 1963 wholesale sales in Botetourt and Roanoke Counties and the city of Roanoke were 80 percent of the national average, per capita retail sales were 104 percent of the national average, and receipts from selected services, 119 percent. Value added by manufacture totaled \$139,522,000 and value added in mining was \$4,041,000 in 1963; the value of farm products sold in 1964 was \$6,961,440 (see Appendix Table 15).

In 1966, Agriculture and Manufacturing were the dominant industries in Botetourt County, whereas in Roanoke County and City they were Manufacturing and Trade, with a substantial portion of employment in Services; the average rates of unemployment were 4.8 and 2.3 percent, respectively (see Appendix Table 16).

There are 55 manufacturing establishments with 50 or more employees in the Buchanan-Roanoke growth center: 17 with employment of 50 to 99, 24 with 100 to 249, 5 with 250 to 499, 7 with 500 to 999, and 2 with more than 1,000. Total employment in these plants was about 15,000 in 1966. Thirteen of them are in food industries, 9 in apparel, 5 in fabricated metals, 4 each in furniture and stone, clay, and glass products, 3 in printing and publishing, 2 each in electrical machinery, textiles and transportation equipment, and 1 each in chemical, leather, and lumber and wood products. The local employment multiplier for Botetourt County is 2.0 (see Appendix Table 11).

The growth center contains an air carrier airport which offers service via 2 airlines, and a Class I railroad and an interstate highway run the full length of the eastern part of it.

The center contains 2 private liberal arts colleges (1 coeducational and 1 for women) a branch of the State University offering graduate and undergraduate courses, a State community college, 2 NLN-accredited schools for registered nurses, 3 accredited schools for licensed practical nurses, and 2 public libraries with total holdings of 225,000. There are 8 hospitals in the center with a total of more than 1,000 beds for general care patients.

Treated water is supplied to residents of the city of Roanoke, the town of Vinton, and adjacent sections of Roanoke County by a

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system with design capacity of 24,000,000 gallons per day and average daily use of 13,000,000. The Salem water system has a design capacity of 5,000,000 gallons per day and average daily use of 2,600,000. Those at Buchanan and Troutville have design capacities of 240,000 and 200,000 gallons per day and average daily use of 200,000 and 40,000, respectively. Sewage treatment is provided for Roanoke, Salem, and part of the County by a plant with a design population of 220,000 and connected equivalent of 150,000. It provides secondary treatment, and chlorination facilities are under construction. The town of Vinton and adjacent areas are served by a plant providing secondary treatment with chlorination for a design population of 6,000 and average daily flow of 500,000 gallons. The plant at Buchanan provides primary treatment with chlorination for a design population of 1,900 and connected equivalent of 1,350. Four small dams and 7 miles of channel improvement are planned for construction upstream from the growth center on the Roanoke River, and 2 large ones on the James River, for flood prevention and water quality control.

Available industrial sites include 6 at the southern end of the growth center alongside the Roanoke River, adjacent to rail, water, sewer, and gas lines, and varying in size from 85 to 250 acres; and 3 at the northern end of the center alongside the James River, adjacent to rail and gas lines, and varying in size from 400 to 500 acres.

Progress in local planning to date is shown in the following table:

Locality	Planning Commission Formed	Zoning Ordi- nance	Subdi- vision Ordin.	Land Use Plan
Botetourt County	x	x	x	
Roanoke County	x	x	x	x
Roanoke City	x	x	x	×
Salem Town	x	x	×	x
Vinton Town	x	x	x	

Roanoke City employs a full-time planning staff, and all of these localities are members of the Roanoke Valley Regional Planning Commission. Comprehensive land use and highway transportation plans have been prepared for the Roanoke Valley Region.

Total personal income increased by 34 percent in Botetourt and 59 percent in Roanoke County and by 14 percent in Roanoke City from 1960 to 1965 (see Appendix Table 17).

This growth center has a well-established economic base: it has diversified manufacturing employment and is the wholesale trade and service center for a wide territory.

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Covington-Clifton Forge Area

The Covington-Clifton Forge growth area consists of Alleghany County, the independent cities of Clifton Forge and Covington, and a part of Bath County. Its population decreased at an average annual rate of 0.3 percent in the 1950's (see Appendix Table 9), but leveled off in the 1960's and is projected to increase at about 0.6 percent annually from 1965 to 1970 (see Appendix Table 12). Its growth center extends from Covington to Clifton Forge along Interstate Highway 64.

In 1960, about 9 percent of the workers residing in Alleghany County and Covington and Clifton Forge cities commuted to jobs outside the county. Per capita 1963 retail sales were 95 percent of the U.S. average, and per capita receipts from selected services were 44 percent of it. About 41 percent of 1966 employment was in the Manufacturing industry division, with 13 percent in Trade and 8 percent in Service industries and only 1 percent in Agriculture (see Appendix Table 16).

There are 10 manufacturing establishments with 20 or more employees in the Covington-Clifton Forge growth center: 4 with 20 to 49 employees, 2 with 50 to 99, 1 with 100 to 249, 1 with 500 to 999, and 2 with over 1,000. In 1966, the average employment in these plants totaled about 5,000. Three are in food processing industries and 1 each in apparel, chemicals, furniture, instruments, paper, printing and publishing, and rubber products. The local employment multiplier is 1.8 for Clifton Forge City and 1.7 for Alleghany County-Covington City (see Appendix Table 11).

The growth center contains a general service airport with a 1,700-foot paved runway and is served by an air carrier airport with service via 1 airline about 10 miles away. A Class I railroad and an interstate highway run the full length of it.

The center contains a State community college, an NLN-accredited school for registered nurses, and a county public library with holdings of 34,000.

The water supply systems at Clifton Forge and Covington have design capacities of 3,000,000 and 2,500,000 and average daily use of 1,800,000 and 1,400,000 gallons per day, respectively. The sewage systems provide primary treatment with chlorination for design populations of 10,000 and 30,000 and connected equivalents of 6,500 and 24,000. The aforementioned large dams planned for construction on the James River headwaters will provide flood prevention and water quality control benefits for this growth center.

Local planning work is as follows:

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Locality	Planning Commission Formed	Zoning Ordi- nance	Subdi- vision Ordin.	Land Use Plan
Alleghany County	x		x	
Clifton Forge City	x		x	
Covington City	x	x	x	x

All 3 localities are members of a regional planning commission.

Total personal income increased by 48 percent in Alleghany County, 38 percent in Clifton Forge City, and 12 percent in Covington City from 1960 to 1965 (see Appendix Table 17).

This growth area has well-established manufacturing and retail trade bases and should promote the growth of service establishments. There are encouraging current developments in local and regional planning.

IV. MEASUREMENT OF APPLICANT'S ABILITY TO PAY IN ALLOCATING SECTION 214 GRANTS

These funds are provided in the Act,

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"In order to enable the people, States, and local communities of the region. . .to take maximum advantage of Federal grant-in-aid programs. . .for which they are eligible but for which, because of their economic situation, they cannot supply the required matching share. . ."*

We assume that matching shares will ordinarily be obtained by incurring long-term debt, so that, if the applicant has already incurred bonded indebtedness to the full limit permitted by law, then the applicant is entitled to the maximum permissible Section 214 grant.

In Virginia, legal limits on bonded indebtedness are established for independent cities at 18 percent of the assessed value of property subject to local taxation, but no legal limits exist for counties or towns. Even in the case of an independent city, the maximum permissible debt limit may be unrealistic in the sense that the city's bond rating

^{*/} Appalachian Regional Development Act, Section 214(a).

may be such that it could not hope to sell bonds up to the amount permitted by law.

To deal with this question, as well as feasible borrowing by counties and towns, we propose to seek information on the established or published bond ratings of the counties, towns, and cities in Virginia's Appalachia, to supplement the ratings with investment bankers' estimates of bond financing feasible for each, and to use these figures as the basic data in establishing ability to pay. Similar investigations will be made of non-profit corporations as applications come in from them.

Pending the compilation of these data, we propose to use the following procedures in allocating Section 214 funds to eligible projects:

- 1. If the applicant is a State agency and State funds are the only source of the non-Federal share, the appropriated funds available to the agency will be compared with present and prospective demands for them.
- 2. For independent cities, the legally permissible expansion of bond financing will be compared with commitments shown in the city's capital budget.
- 3. Public authorities amortizing their matching shares from revenues will be analyzed in terms of available bond financing obtainable on the basis of service or user charges comparable to those for similar services in other communities.
- 4. Non-profit private organizations will be considered on a case by case basis involving analysis of financial statements and capital investment commitments.
- 5. County government agencies' allocations will be determined on the basis of the formula presented in the following tables.

Per Cent of Maximum Permissible Section 214
Grants to be Recommended

				5A+10B+10C
Counties	0.5A	<u>10 B</u>	<u>10 C</u>	(max. 98)
Alleghany	15.5	30.9	47.1	93.5
Bath	23.2	36.3	5.9	65.4
Bland	28.1	25.3	23.0	76.4
Botetourt	18.1	36.6	27.4	82.1
Buchanan	25.1	25.9	21.5	72.5
Carrol1	24.8	19.1	21.2	65.1
Craig	23.4	21.2	8.8	53.4
Dickenson	25.4	35.6	6.9	67.9
Floyd	25.1	27.4	30.3	82.8
Giles	16.1	38.0	28.7	82.8
Grayson	25.3	17.1	16.6	59.0
Highland	33.2	53.7	18.7	98.0
Lee	34.6	38.1	24.0	96.7
Pulaski	16.9	21.7	7.8	46.4
Russell	25.5	38.9	26.3	90.7
Scott	27.3	26.2	20.4	73.9
Smyth	17.5	19.7	32.8	70.0
Tazewell	20.6	19.9	27.8	68.3
Washington	22.6	26.1	39.7	88.4
Wise	22.4	26.9	30.0	79.3
Wythe	23.2	26.9	31.4	81.5

A = % of familes with less than \$3,000 income, 1959.

The Particular State of the Assessment

B = Local revenue as % of personal income, 1965.

C = Net debt 1965 as % taxable property 1964.

Personal Income and Local Government Revenue from Local Sources in Virginia's Appalachian Counties for the Fiscal Year Ended June 30, 1965

1965 Counties	Total Personal Income (000)	Local Govt. Revenue from Own Sources	Local Rev. as % of Income
Alleghany	27,400	846,710	3.090
Bath	8,708	316,313	3.632
Bland	7,311	185,030	2.531
Botetourt	31,227	1,143,883	3.663
Buchanan	41,145	1,063,672	2.585
Carroll	35,781	684,166	1.912
Craig	5,676	120,073	2.115
Dickenson	19,806	705,953	3.564
Floyd	16,672	457,529	2.744
Giles	34,206	1,298,958	3.797
Grayson	25,291	432,922	1.712
Highland	3,999	214,868	5.373
Lee	21,902	835,364	3.814
Pulaski	55,291	1,198,279	2.167
Russell	32,745	1,274,809	3.893
Scott	29,962	784,020	2.617
Smyth	47,686	938,877	1.969
Tazewell	68,331	1,356,275	1.985
Washington	61,186	1,594,898	2.607
Wise	52,752	1,417,427	2.687
Wythe	35,698	959,773	2.689

Sources: Virginia Auditor of Public Accounts and Virginia Bureau of Population and Economic Research

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Estimated True Value of Property Taxable for Local Purposes and Net Indebtedness of Virginia's Appalachian Counties

Counties	Est. True Value of Taxable Property, 1964	Net Debt, 1965	Net Debt as % of Val. of Property
Alleghany	\$ 48,940,000	\$2,302,880	4.706
Bath	28,503,000	168,900	0.593
Bland	15,869,000	365,687	2.304
Botetourt	84,537,000	2,311,670	2.735
Buchanan	85,869,000	1,846,373	2.150
Carroll	74,789,000	1,585,884	2.120
Craig	11,478,000	101,046	0.880
Dickenson	51,585,000	353,415	0.685
Floyd	30,839,000	933,800	3.082
Giles	102,403,000	2,940,250	2.871
Grayson	49,705,000	826,771	1.663
Highland	17,557,000	329,000	1.874
Lee	59,504,000	1,430,245	2.404
Pulaski	104,352,000	815,045	0.781
Russell	153,389,000	4,037,200	2.632
Scott	65,598,000	1,339,771	2.042
Smyth	88,072,000	2,891,996	3.284
Tazewell	116,529,000	3,237,864	2.779
Washington	125,032,000	4,965,582	3.971
Wise	82,798,000	2,481,047	2.997
Wyt h e	77,706,000	2,437,550	3.137

SOURCE: Department of Taxation and Auditor of Public Accounts.

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V. DESCRIPTION OF STATE RESEARCH PROJECTS

Demonstration Health Study

This study is designed to prepare a proposal for a demonstration health project in 7 southwestern counties in Virginia. It is being conducted under the general supervision of Drs. R. W. Jessee and R. W. Moseley, of the State Health Department, with a grant of \$40,000 (\$30,000, Section 302 and \$10,000, State funds) made in January 1967 for a period of 18 months. Mr. Russell Owens was employed as Project Director on June 15, 1967, and has established an office at Abingdon.

A Community Planning Council has been established in each county and several meetings held with representatives of the Medical College of Virginia, the School of Medicine at the University of Virginia, and the Southwest Virginia Medical Society to determine their respective roles in the project, which is being conducted according to the guidelines in Section 202-3 of the ARC Code in consultation with ARC Health Advisory Committee personnel at Charlottesville and Washington.

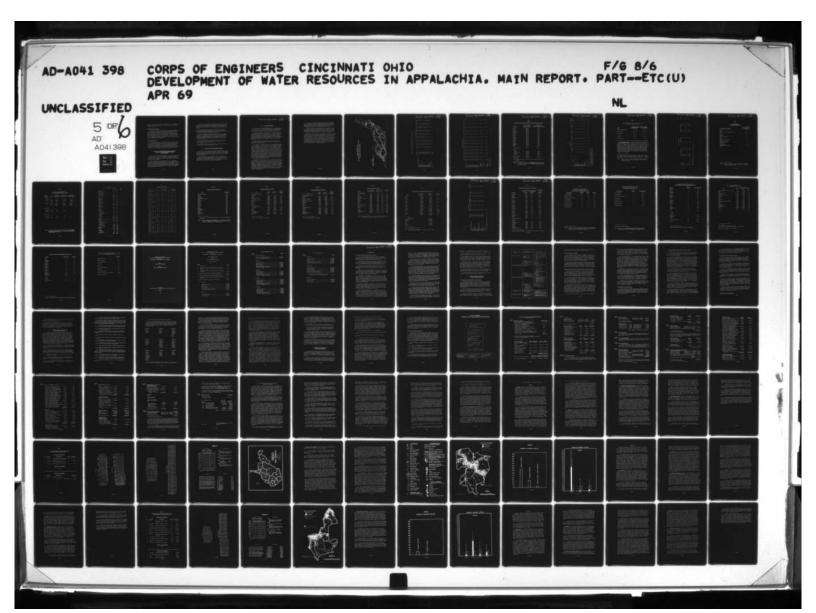
Galax-Carroll-Grayson Development Study

This study is designed to prepare an investment plan for the Counties of Carroll and Grayson and the city of Galax, establish a development planning process and capability, and train personnel who can continue to conduct the planning and development function and execute plans prepared by the Virginia Division of Industrial Development, as outlined in the 4-phase work plan submitted to ARC with the project proposal (q.v.). It is being conducted by the Galax-Carroll-Grayson Chamber of Commerce under the direction of Mr. Russ Bateson, Executive Director of the Chamber, who began work on May 15, 1967, with a grant of \$36,800 (\$27,600, Section 302 and \$9,200, local) beginning June 1967 for a period of 12 months.

Land Use Evaluation Study

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This study is designed to determine the location and extent of developable land in and around incorporated places in the 7 southwestern counties of Virginia within easy access of major arterial routes between communities. It is being conducted under the general supervision of Dr. H. W. Westermann, of the Center for Urban and Regional Studies at Virginia Polytechnic Institute. The Project Director is Professor Alan Winslow, who began work on the project with a research staff of 2 geologists, l architectural engineer, and 5 graduate students in June 1967, with a grant of \$23,200 from Section 302 for a period of 4 months. The study is to be carried out in 4



stages, with the final evaluation and summary report to be submitted by October 15, 1967, as described in the project proposal submitted to ARC on June 13, 1967.

Disadvantaged People Study

This study is designed to provide a more accurate determination of the socio-economic characteristics of the disadvantaged people in the 7 southwestern counties of the State and the extent to which public assistance programs are available to meet their needs. The project leader will be Professor Leland B. Tate, of the Department of Psychology and Sociology at V.P.I., assisted by a staff of 1 sociologist, 1 economist, and several consultants. A preliminary proposal has been submitted to ARC for a 3-phase study over a period of 2 years, with an estimated cost of \$106,000.

Apple Marketing Study

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This study is designed to determine the economic feasibility of various combinations of packing and sales facilities for apples (and other fruits and vegetables) as a means of improving returns to the apple industry in Wise County. It is being conducted by the Agricultural Economics Department of Virginia Polytechnic Institute at an estimated cost of \$9,500 (including an EDA technical assistance grant of \$6,500), and is expected to be completed in the summer of 1967.

VI. PROVISIONS FOR MORE EFFECTIVE COORDINATION BETWEEN PUBLIC AND PRIVATE INSTITUTIONS CONCERNED WITH DEVELOPMENT

The Division of Industrial Development is continuing and extending its working relations with the development staffs of banks, chambers of commerce, local and regional industrial development commissions, railroads, utility companies, and other private and public institutions concerned with development.

These procedures are an established part of the training and practice of our industrial representatives in their negotiations with present and prospective employers, and of the other sections of the Division through exchanges of information and joint meetings. A recent addition to the staff is devoting full time to community development work, with emphasis on the problems faced by business establishments presently operating in Virginia.

The Director of the Industrial Development Division is also State coordinator for the EDA program in Virginia, and several members of the staff work closely with the staff people of the 3 economic development districts in the State and with the EDA Field Coordinator at Abingdon.

As stated in earlier sections of this report, the Industrial Development Division makes extensive use of the research reports of the State Planning Division whose staff now includes the new Coordinator of Federal Programs, Urban and County Affairs.

The State Planning Division has operating control of 2 Federal programs ("701" and OEO) plus general coordinating responsibility for all Federal programs in the State. The latter work is headed by the Coordinator of Federal Programs, Urban and County Affairs. This Division has designated boundaries for development planning districts throughout the State.

In the area of river basin development, the Division of Water Resources and the Water Control Board have operating control of Federal programs for water resources.

Washington County and the city of Bristol have joined the First Tennessee-Virginia Economic Development District.

VII. PLANS FOR FINANCING DEVELOPMENT DISTRICTS

The State staff coordinating Appalachian Development efforts and the local multi-county development planning organizations are currently financed 75 percent by Appalachian Section 302 funds or by the Economic Development Administration and 25 percent by the State and by county and city governments.

Budget requests have been submitted for State appropriations to the Division of Industrial Development to finance 100 percent of the State Appalachian coordinating work, and it is expected that local governmental units will finance 100 percent of the multi-county development costs after Federal assistance is discontinued.

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VIII. GOALS AND OBJECTIVES

This statement of development policies for the Appalachian portion of Virginia in Fiscal Year 1968 delineates a strategy which, over a period of time and with continual refinement, is designed to accelerate the economic and social development of the Region.

The general purpose of this strategy is to assist the people of the Region in acquiring the training, skills, and health which are needed to participate in and contribute to the nation's economy wherever they may choose to live and to help the Region develop a diversified economy which affords continually increasing employment and income opportunities and rising standards of living and which makes its own distinctive contributions to national wealth and development.

A major approach to these purposes involves the relation of statewide planning as well as local and regional planning, to the Appalachian development effort.

The policies set forth herein are extensions and amplifications of the development strategy established by the 1966 General Assembly and this Administration. The capstone of this strategy is to make massive improvements in our State and local educational programs, thereby enabling every individual to participate productively in our society. We will step up construction of the State's systems of interstate and arterial highways, thereby facilitating the quick and economical movement of people and goods. We will continue our efforts to meet demands for essential public services on an ascending level, and we will take action to conserve and develop the water and other natural resources of the Commonwealth. The programs of the Appalachian Regional Commission are viewed as instruments through which we can accelerate the accomplishment of these State objectives and, in keeping with the philosophy of these programs enable them to serve the dual purpose of promoting the economic expansion of areas which have a significant potential for growth.

The principal area earmarked to receive the bulk of Appalachian investments in the interim statement for FY 1967 was the relatively densely populated 7-county area which forms the southwestern tip of Virginia. This area constitutes the Virginia portion of the Central Appalachian territory, which is currently under study by the Appalachian Regional Commission with the help of a research grant from the Department of Housing and Urban Development. In addition, one research group in the State Department of Health and 3 at the Virginia Polytechnic Institute are investigating problems of the 7-county area with the help of State research grants under the Appalachian and Economic Development Acts.

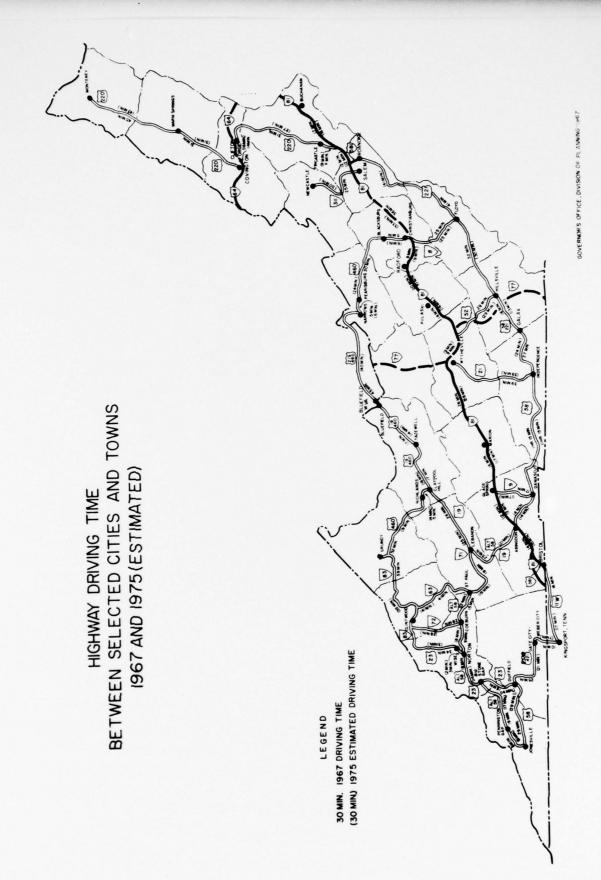
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In the light of analysis and experience with the program subsequent to the FY 1967 policy statement, this statement was amended by letter of December 21, 1966, to include growth centers east of the 7-county area along Interstate 81 and Highways 58 and 460, and the 1968 statement includes the 8 growth areas discussed above.

A general strategy for developing the entire region is to accelerate the construction of highways and airports for better access to the region's growth areas, the construction and equipment of schools and libraries for improved education and training, and the provision of comprehensive health services for all people in the region.

Other parts of the program will vary from one locality to another, depending on the level of economic development and estimated potential for future growth in each case. Some potential growth centers lack some of the essential facilities needed to attract industry, while others need certain facilities to accommodate industries already established. Some need research and staff support for established development organizations, while others need guidance and encouragement to bring these organizations into being. These varied situations and recommended programs are described above in general terms: a detailed list of specific projects, showing location, cost, and funding for each, is being prepared as a separate document.

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	Population	1880-	1890-	1900-	1910-	-0761	1930-	1940-	1930-	1960-
Area	7/1/66	1890	1900	1910	1920	1930	1940	1950	1960	1966
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Alleghany-Clitton Forge-Covington	29,236	0.00	93.1	0.77	1.3	1.63	0			
Bath	5,320	2.3	22.0	16.7	- 2.3	27.3	-11.6	-12.5	-15.3	r
Bland	5,951	2.5	7.2	- 6.2	8.5	7.8	11.6	7.7 -	- 7.1	5
Botetourt	18,019	.3	15.5	3.3	9.9 -	- 6.7	6.5	- 4.1	0.9	7.8
Buchanan	38.459	3.0	65.2	23.7	25.2	8.4	0.38	13.6	2.7	4.7
Carroll-Graveon-Calax	47.653	13.3	21.0	15.4	1.5	5.6	14.1	4.5	-14.1	4.0
Craio	3,435	1.1	11.9	9.7	-13.0	-13.0	5.8	7.8 -	- 2.8	2.4
Dickenson	19,044		52.6	18.7	47.2	19.4	31.6	10.0	13.6	-5.8
Flood	10.396	8.7	8.9	- 8.4	6.9 -	-10.8	2.3	- 5.1	- 7.8	9
Ciles	17.490	3.4	18.7	7.7	2.4	7.6	14.3	29.5	- 9.2	1.6
Highland	2,923	3.6	5.5	- 5.9	- 7.3	- 8.2	- 7.7	-16.5	-20.8	-9.3
100	23.845	20.5	0.6	20.1	6.1	20.3	29.2	- 8.1	-28.5	7.7-
Pulaski	28.524	46.1	14.2	18.0	8.	20.2	10.7	21.9	- 1.8	9.4
Russell	27.661	16.0	11.8	30.2	14.1	- 3.1	2.6	.7	- 2.0	5.2
Scott	24.833	25.9	4.6	6.4	0.4	- 2.4	11.6	2.4	9.9 -	-3.8
Smyth	32,164	6.6	28.2	18.7	8.8	13.5	14.9	9.4	2.9	3.5
Tazewell	43.543	54.7	17.5	6.7	11.6	16.7	28.1	14.2	- 5.7	-2.8
Washington-Bristol	57.857	8.4	15.7	16.4	.1	9.2	12.3	11.5	3.2	8.4
Wise-Norton	45,441	20.2	110.3	73.8	36.1	10.0	2.5	7.4	-13.8	-6.5
Wythe	22,541	25.8	13.4	3	7	2.4	9.7	2.7	- 5.8	5.6
Virginia Appalachia	504,635	19.9	22.8	16.6	8.4	8.7	15.2	8.4	- 7.9	6.
State	4,538,937	9.5	12.0	11.2	12.0	6.4	10.6	23.9	19.2	14.8

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	Under	\$1,000	\$2,000	\$3,000 to	\$4,000	\$5,000	\$6,000	\$7,000 to	\$8,000	\$9,000	\$10,000	\$15,000	\$25,000
Area	\$1,000	\$1,999	\$7,999	33,939	34,999	50,999	50,999	\$1,999	58,399	33,333	514,333	374,999	ŏ
Alleghany	9.5	10.3	11.2	11.9	14.2	11.8	9.6	5.9	8.4	2.8	5.6	1.3	
Bath	10.3	19.2	16.8	16.9	8.0	9.5	7.4	4.1	3.8	.3	2.8	6.	
Bland	17.7	23.2	15.2	15.7	7.6	7.4	4.7	2.1	9.	2.3	1.2	5.	
Botetourt	8.6	12.6	13.8	13.2	17.7	10.2	8.3	5.1	3.4	2.3	3.0	.3	
Buchanan	15.7	14.5	20.0	15.0	10.3	7.5	5.7	3.0	3.1	1.4	2.3	9.	
Carroll	15.5	16.0	18.1	16.7	14.0	8.9	3.5	2.8	1.6	6.	1.4	.3	
Craig	11.4	22.1	13.3	13.8	14.9	9.2	6.7	2.0	3.5	1.9	1.1		
Dickenson	20.1	15.8	14.9	10.7	8.3	8.0	8.3	8.4	2.8	2.4	3.1	9.	
Floyd	17.1	16.9	1.91	15.1	13.5	8.1	6.4	2.8	1.7	.7	2.0	9.	
Giles	10.5	11.6	10.0	14.4	16.8	12.2	5.9	5.9	4.5	3.6	3.8	9.	
Grayson	17.3	0.41	19.2	15.1	14.1	8.8	5.2	3.4	1.3	.7	9.	.2	
Highland	19.8	23.8	22.7	14.7	8.2	3.4	3.3	3.2	:		5.	5.	•
Lee	29.7	23.7	15.7	11.0	5.9	5.3	3.7	1.6	80.	.5	1.4	7.	
Pulaski	10.3	10.5	12.9	13.0	14.5	11.4	8.1	5.8	4.2	2.6	4.5	1.7	
Russell	19.0	16.6	15.4	12.0	9.7	6.9	7.4	9.4	2.6	1.9	3.1	9.	
Scott	22.7	19.2	12.7	10.0	9.5	0.6	0.9	3.9	2.1	1.4	2.7	9.	
Smyth	10.0	12.0	13.0	16.0	15.4	11.0	7.4	5.2	3.3	2.3	2.9	6.	
Tazewell	12.9	13.4	14.9	14.1	12.4	11.9	7.1	3.5	2.7	1.9	3.5	6.	
Washington	15.0	15.6	14.6	14.0	14.9	8.3	5.2	3.9	2.9	1.7	3.2	e.	
Wise	14.7	14.9	15.1	11.7	10.7	10.4	7.6	9.4	5.9	2.3	3.6	1.2	
Wythe	12.2	17.1	17.0	15.6	14.8	8.0	5.7	2.7	2.3	1.0	2.1	1.0	
Bristol	7.9	10.4	13.0	12.7	13.1	11.6	8.5	6.4	4.5	3.3	5.2	2.4	1.1
Clifton Forge	8.2	8.9	9.6	10.9	11.4	14.7	11.5	6.7	6.9	3.0	8.5	1.7	
Covington	4.7	5.7	6.1	7.6	15.0	16.7	13.7	7.2	6.3	4.6	0.6	1.5	
Galax	5.3	10.2	18.4	14.2	14.7	8.7	7.6	5.0	3.0	2.2	6.1	2.5	2
Norton	12.1	13.3	12.9	12.6	9.8	11.1	7.9	5.3	2.0	3.7	5.1	1.3	-
Va. Appalachia	14.6	14.7	14.8	13.4	12.5	9.6	6.7	4.2	3.0	1.9	3.2	œ.	
Ster S	7 8	0 6	10.5	11.2	11 3	8.01	0	7 7	c.	7 7	5	00	
Urban	5.4	8.5	7.9	9.7	10.7	11.4	10.2	8.5	6.9	5.3	13.1	3.8	1.2
Rural Nonfarm	10.5	11.3	13.5	13.5	12.8	10.8	7.9	5.7	4.1	2.7	5.1	1.5	
Kural Farm	18.6	19.3	15.3	4.71	8.6	6.6	4.0	3.3	2.3	1.1	3.4	1.3	

SOURCE: 1960 Census of Population

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TABLE 3

Public School Expenditures and Teacher Education Levels, 1965-66

Counties	Cost of Public School Operation per Pupil in ADA*/	Percent of Classroom Teachers Who Are College Graduates
Alleghany	\$ 324.25	82.2
Bath	388.56	73.4
Bland	327.69	69.3
Botetourt	336.49	73.5
Buchanan	246.32	58.0
Carroll	292.48	73.1
Craig	303.38	70.9
Dickerson	303.92	59.4
Floyd	391.27	78.8
Giles	379.72	91.4
Grayson	302.54	61.2
Highland	453.44	78.1
Lee	343.41	76.5
Pulaski	329.05	90.6
Russell	344.92	65.6
Scott	322.26	63.7
Smyth	297.61	78.4
Tazewell	313.51	71.2
Washington	355.74	73.1
Wise	347.40	64.5
Wythe	332.12	82.9
Va. County Median	(386.94)	(85.1)
Cities		
Bristol	393.20	97.3
Clifton Forge	378.91	89.2
Covington	396.50	88.0
Galax	285.33	85.0
Norton	328.17	78.4
Va. City Median	(402.05)	(93.5)
State Median	(392.48)	(88.3)

^{*/} Excluding debt service, capital outlay, and State retirement contribution

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SOURCES: State Board of Education, Annual Report, 1965-66, and Virginia Education Association, Virginia's Educational Disparities (February 1967).

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TABLE 4

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		Health Needs Indices	es			
	General Hospital	Infant 2,	New Cases of	Practicing,	Practicing,	Active
Area	Beds1/	Mortality 2/	Tuberculosis2/	Physicians-	Dentists	Nurse
Alleghany, Covington, & Clifton Forge	8.9	22	24	130	28	532
	4.7	0	0	115	39	244
Bland	0	70	50	17	17	101
Botetourt	0 0	07	33	42	24	233
Carroll Gravson & Galax	2.3	3.5	280	32	200	78
Craig	0	0	87	30	0	0
Dickenson	0	18	31	36	15	32
Floyd	0	14	38	39	19	38
Giles	3.8	21	22	71	30	183
Highland	0	0	99	69	65	34
Lee	3.1	07	530	42	13	80
Pulaski	3.8	38	32	81	30	210
Russell	1.8	29	83	27	15	9
Scott	0	13	63	39	24	20
Smyth	6.4	28	25	83	29	233
Tazewell	5.0	18	39	70	29	57
Washington & Bristol	2.8	23	38	89	34	252
Wise & Norton	5.8	27	50	85	30	121
Wythe	3.5	30	777	74	97	124
Virginia Appalachia	3.3	27	99	65	26	147
United States	3.9	24	25	139	54	320

1,000 population, 1967, Virginia Department of Health.
1,000 live births, 1965, Virginia Department of Health.
100,000 population, 1965, Virginia Department of Health.
100,000 population, 1967 Appalachian Health Report.
100,000 population, 1963 Appalachian Health Report.
100,000 population, 1966, Virginia Board of Examiners of Nurses. Per Per Per Per विलिक्षित्राची

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TABLE 5

Low-Level Temperature Inversion Frequencies Less Than 500 Feet Above the Surface

	Average	Percent of T	ime Occur	ring
Region	Spring and	Summer	Fall and	Winter
Appalachian Mountains*/	30 -	45+	30 -	45+
Atlantic Coast	10 -	35	10 -	35
Central Plains	20 -	30	30 -	45
Great Lakes	20 -	30	20 -	30
Gulf Coast	10 -	35	10 -	35
Rocky Mountains	30 -	45+	40 -	55+

"Appalachian Mountains. - Less storm frequency in the southeastern states, compared to the area north of Virginia, undoubtedly contribute to the higher inversion frequency found over the southern Appalachian Area. Mountain ridges afford protection to valley areas; consequently, light winds during nighttime hours are common in valleys. Frequent occurrence of anti-cyclonic flow over the southeastern states, particularly during summer and fall months, also enhances nocturnal radiation inversion formation, since clear skies and light winds are associated with many of these high pressure systems.*/ In general, low-level stabilization occurs 30 to 45 percent of the time in the region, while more topographically protected areas have more frequent occurrences of inversions."

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^{*/} Figure 7 in the article shows isopleths of nighttime cloud cover and low wind speed in Southwest Virginia as follows: winter - 50 percent; spring - 50 percent; summer - 70 percent; and fall - 70 percent.

SOURCE: Charles R. Hosler, "Low'Level Inversion Frequency in the Contiguous United States", Monthly Weather Review (September, 1961), pp. 329-331.

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7. Change +29.3 + 7.9 - 3.3 -23.4 -30.9 -53.4 + 9.0

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laries 1966	25,338,949	11,608,756	9,991,245	3,743,504	891,962	336,768	29,335	51,958,621
Wages and Salaries	19,591,043	10,756,519	10,332,694	4,885,613	1,290,847	722,187	52,942	47,661,053
Employees 1966	5,383	1,987	1,823	601	266	88	12	10,168
1960	6,865	2,104	2,768	1,060	523	260	30	13,635
Tonnage 1966	16,305,629	9,319,835	7,334,272	1,920,139	435,614	241,118	11,168	35,572,928
1960	10,629,081	7,129,889	5,498,602	2,294,267	642,523	483,357	16,988	26,706,285
County	Buchanan	Dickenson	Wise	Russell	Lee	Tazewell	Scott	TOTAL

SOURCE: Virginia Department of Labor and Industry, Annual Reports for 1960 and 1966.

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TABLE 7

Mineral Industry Virginia Appalachia, 1966

Raw Material or Commodity	No. of Plants, Pits, Mines, Quarries or Fields
Basalt	1
Cement	1
Clay, Shale, and Related Materials	8
Coal	1,703
Coke	5
Granite	1
Gypsum	2
Iron-Oxide Pigments	1
Lead	1
Lime	1
Limestone and Dolomite	41
Lithium	1
Natural Gas (Fields)	9
Petroleum (Fields)	2
Pyrrhotite	1
Salt Brine	1
Sand and Gravel	2
Sandstone and Quartizite	8
Zinc	1

SOURCE: Division of Mineral Resources, <u>Directory of the Mineral</u> Industry in Virginia - 1966.

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TABLE 8

Forest Survey Statistics,

Southern Mountain Region of Virginia

Species Group	Year	Sawtimber (mil. bd. ft.)	Growing Stock (mil. cu. ft.)	All Timber (mil. cu. ft.)
Inventory:				
Softwood	1940 1957 1966	592.3 656.4 742.9	175.5 212.4 253.3	201.6 246.5 295.5
Hardwood	1940 1957 1966	3,993.0 4,675.7 5,366.0	1,318.2 1,779.1 2,126.6	1,763.3 2,382.2 2,851.4
Net Growth:				
Softwood	1965	34.3	10.4	
Hardwood	1965	206.0	82.1	
Timber Cut:				
Softwood	1965	21.2	5.8	
Hardwood	1965	150.9	43.5	

SOURCE: Southeastern Forest Experiment Station (USDA), <u>Preliminary</u>
Forest Survey Statistics for the Southern Mountain Region of
Virginia, 1966 (July 1966).

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TABLE 9

Labor Supply Areas, Virginia Appalachian Growth Centers

Area	Popula 1960	1950	Average Annual 7 Change
Washington County, Virginia	38,076	37,536	
Bristol, Virginia	17,144	15,954	
Russell County, Virginia:	2,000	2,087	
Copper Creek District Moccasin District	1,171	1,421	
Sullivan County, Tennessee:			
Avoca District	5,009		
Blountville District	9,158		
Bluff City District	4,122 17,582	39,395	
Bristol District Holston Valley District	1,852	(est.)	
Piney Flats District	2.686		
Weaver District	6,710	02 202	+0.9
	105,510	92,393	40.9
Buchanan-Roanoke Bedford County:			
Chamblissburg District	4,261	3,865	
Lisbon District	3,688	4,074	
Botetourt County	16,715	15,766	
Floyd County: Locust Grove District	1,853	2,056	
Franklin County:			
Blackwater District	2,130	1,519	
Boone District	4,376	4,135 (est.)	
Montgomery County:	3,555	3,851	
Alleghany District Roanoke County	61,693	41,486	
Roanoke City	97,110	91,921	
	195,381	168,673	+1.5
Covington-Clifton Forge	12,128	23,139	
Alleghany County Bath County:	12,120	25,157	
Cedar Creek District	2,461	2,958	
Millboro District	1,040	1,213	
Clifton Forge City	5,268 11,062	5,795	
Covington City	31,959	33,105	-0.3
Duffield-Wise	,		
Dickenson County:			
Clintwood District	5,920 4,466	6,321 5,097	
Ervinton District Kenady District	1,878	2,155	
Lee County:	1,0.0	-,	
Jonesville District	5,197	6,336	
Rocky Station District	10,292	15,624	
Yokum Station District	3,985	5,014	
Russell County: Castlewood District	6,837	7,401	
Scott County:			
DeKalb District	3,003	3,573	
Floyd District	1,811 2,664	2,114 2,831	
Powell District Taylor District	3,726	3,865	
Wise County	43,579	56,336	
Norton City	5,013	*****	
	98,355	116,667	-1.5
Galax-Hillsville Carroll County	23,178	26,695	
Floyd County (Except Locust Grove District)	8,609	9,295	
Galax City	5,254		
Grayson County	17,390 54,431	21,379 57,369	-0.5
Lebanon-Bluefield, West Virginia	54,451	37,307	0.5
Buchanan County:			
Gordon District	5,836	6,277	
Russell County, Virginia:	1,841	1,857	
Cleveland District Elk Garden District	2,007	1,854	
Lebanon District	4,180	3,715	
New Garden District	8,254	8,438	
Tazewell County, Virginia	44,791	47,512	
Bluefield City, West Virginia	19,256 86,165	21,506 91,204	-0.5
,	00,103	71,204	
Marion Wytheville Bland County	5,982	6,436	
Smyth County	31,066	30,187	
Wythe County	21,975	23,327	
	59,023	59,950	-0.2
Pulaski-Narrows	17,219	18,956	
Giles County Montgomery County:	17,219	10,770	
Auburn District	3,605	3,753	
Blacksburg District	15,536	13,459	
Christiansburg District	10,227	8,717	
Pulaski County Radford City	27,258 9,371	27,758 9,026	
	83,216	71000	+0.2

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TABLE 10

Estimated Potential Labor Supply, Virginia Appalachian Growth Areas

SOURCE OF SUPPLY	TOTAL	WHITE MA	NONWHI TE	WHITE FE	MALE NONWHITE
Bristol-Abingdon Area	466				
Total	6,570	2,460	80	3,920	110
Outside Labor Force	3,130			3,050	80
From Agriculture Unemployed	590 1,200	570 810	20 30	350	10
Annual New Entrants	1,650	1,080	30	520	20
Buchanan-Roanoke Area				-	
Total	7,700	2,750	420	4,000	530
Outside Labor Force	2,470			2,220	250
From Agriculture	290	260	30		
Unemployed	2,190	920	130	1,000	140
Annual New Entrants	2,750	1,570	260	780	140
Covington-Clifton Forge					1.
Total	1,540	640	80	740	80
Outside Labor Force	490		10	450	40
From Agriculture Unemployed	70 470	60 280	10 30	140	20
Annual New Entrants	510	300	40	150	20
Duffield-Wise Area					
Total	8,510	2,720	280	5,270	240
Outside Labor Force	4,280			4,190	90
From Agriculture	620	610	10		
Unemployed	1,770	880	250	500	140
Annual New Entrants	1,840	1,230	20	580	10
Galax-Hillsville					
Total	3,450	1,480	180	1,600	190
Outside Labor Force	960			940	20
From Agriculture Unemployed	560 1,070	540 370	20 140	400	160
Annual New Entrants	860	570	20	260	100
Amour New Entrance			20	200	-
Lebanon-Bluefield, W. Va.					
Total	6,970	2,220	130	4,380	240
Outside Labor Force From Agriculture	3,460 460	450	10	3,300	160
Unemployed	1,550	780	70	640	60
Annual New Entrants	1,500	990	50	440	20
Marion-Wytheville Area					
Total	3,750	1,260	70	2,300	120
Outside Labor Force	1,580			1,540	40
From Agriculture Unemployed	480 760	460 190	20 30	470	70
Annual New Entrants	930	610	20	290	10
Pulaski-Narrows Area				1999	
Total	3,000	1,230	90	1,590	90
Outside Labor Force	720			690	30
From Agriculture	210	200	10		
Unemployed Annual New Entrants	1,260	240 790	30 50	510 390	30
Amount new Entrants	1,200	790	30	390	30

SOURCE: Virginia Employment Commission.

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TABLE 11

Local Employment Multipliers*/

Area	Multiplier
Alleghany-Covington	1.68
Bath	1.60
Bland	1.52
Botetourt	2.01
Buchanan	1.56
Galax-Carroll-Grayson	1.67
Craig	1.69
Dickenson	1.67
Floyd	1.50
Giles	2.04
Highland	1.41
Lee	1.71
Pulaski	1.95
Russell	1.52
Scott	1.64
Smyth	2.07
Tazewel1	2.13
Washington	2.22
Wise-Norton	1.91
Wythe	1.89
Bristol	2.53
Clifton Forge	1.80
Radford	2.11

^{*/} Increase in total employment generated by unit increase in exogenous employment.

SOURCE: Report on <u>Recreation as an Industry</u> to the Appalachian Regional Commission by Robert R. Nathan Associates and Resource Planning Associates, Washington, D. C., December, 1966.

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TABLE 12
Projected Population, 1965-1970

Area	Actual 1965	Projected 1970	Average Annual % Change
Alleghany-Clifton Forge-			
Covington	28,953	29,916	+0.7
Bath	5,308	5,361	+0.2
Bland	6,007	6,067	+0.2
Botetourt-(Roanoke)	193,841	218,180	+2.3
Buchanan	38,484	40,447	+1.0
Carroll-Grayson-Galax	46,877	52,136	+2.1
Craig	3,408	3,468	+0.3
Dickenson	19,571	19,325	-0.6
Floyd	10,524	10,630	+0.2
Giles	18,091	19,041	+1.0
Highland	3,041	2,965	-0.5
Lee	24,362	23,120	-1.0
Pulaski-(Montgomery-			
Radford)	75,480	86,766	+3.0
Russell	27,606	29,014	+1.0
Scott	25,395	25,014	-0.3
Smyth	32,372	34,665	+1.3
Tazewell	43,661	45,888	+1.0
Washington-Bristol-			
(Kingsport)	180,977	205,260	+2.5
Wise-Norton	45,857	43,518	-1.0
Wythe	22,697	24,211	+1.3

SOURCE: Virginia Division of Planning.

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TABLE 13
Projected Employment, 1965-1970

	Actual	Projected	Average Annual
Area	1965	1970	% Change
Alleghany-Clifton Forge-			
Covington	11,043	11,900	+1.5
Bath	2,060	2,175	+1.1
Bland	1,527	1,909	+4.5
Botetourt-(Roanoke)	77,837	89,053	+2.7
Buchanan	8,378	8,593	+ .5
Carroll-Grayson-Galax	16,405	17,247	+2.8
Craig	721	730	+ .2
Dickenson	4,354	4,353	0
Floyd	2,438	2,388	-0.4
Giles	6,407	7,220	+2.4
Highland	1,145	1,173	+ .5
Lee	5,071	4,600	-1.8
Pulaski-(Montgomery-			
Radford)	28,679	36,155	+4.8
Russell	6,810	6,975	+ .5
Scott	6,770	6,700	2
Smyth	9,374	11,555	+4.3
Tazewell	12,615	13,380	+1.2
Washington-Bristol	19,507	21,654	+1.2
Wise-Norton	11,393	11,158	4
Wythe	6,912	7,929	+2.8

SOURCE: Virginia Division of Planning.

TABLE 14

Job Commuting Patterns, 1960

	No. Reporting	Commutin	g Out	Commuting
Counties	Place of Work	Number	%	In
Alleghany-Clifton				
Forge-Covington	9,409	805	8.6	445
Bath	1,769	102	5.8	104
Bland	1,640	347	21.2	91
Botetourt	5,418	2,187	40.4	338
Buchanan	7,960	345	4.3	1,844
Carroll-Grayson-Galax	14,791	1,854	12.5	548
Craig	1,087	353	32.5	30
Dickenson	3,937	6 67	16.9	794
Floyd	3,290	1,052	32.0	112
Giles	5,142	558	10.9	1,100
Highland	951	98	10.3	13
Lee	5,234	830	15.9	72
Montgomery-Radford	13,830	1,617	11.7	1,568
Pulaski	8,832	1,932	21.9	1,134
Roanoke County & City	55,985	2,410	4.3	5,390
Russell	6,424	1,479	23.0	756
Scott	6,380	2,556	40.1	208
Smyth	9,183	464	5.1	1,130
Tazewell	10,938	3,291	30.1	931
Washington-Bristol	16,859	4,043	24.0	4,046
Wise-Norton	11,189	1,297	11.6	1,007
Wythe	6,541	1,206	18.4	170

SOURCE: Unpublished tabulations of U.S. Bureau of the Census, from 1960 Census of Population (based on a 25% sample).

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TABLE 15

Value of Agricultural, Manufacturing, and Mining Production

<u>Counties</u>	Value of Farm Products Sold 1964	Value Added by Manufacture 1963	Value Added in Mining 1963
Alleghany	587,912	(D)	
Bath	918,653	47,000	
Bland	1,536,720	(D)	
Botetourt	3,605,459	10,318,000	2,509,000
Buchanan	183,121	1,995,000	41,624,000
Carrol1	4,163,585	6,048,000	
Craig	630,429	(D)	
Dickenson	244,924	642,000	25,468,000
Floyd	2,877,867	1,913,000	
Giles	997,034	(D)	
Grayson	3,526,784	9,905,000	
Highland	1,800,027	920,000	
Lee	4,147,947	97,000	2,469,000
Montgomery	3,344,090	34,727,000	
Pulaski	2,474,690	23,045,000	
Roanoke	3,355,981	71,863,000	1,532,000
Russell	4,775,545	1,648,000	6,778,000
Scott	3,646,026	1,008,000	847,000
Smyth	4,115,365	48,522,000	604,000
Tazewell	2,840,818	12,756,000	5,112,000
Washington	9,303,791	9,236,000	
Wise	659,054	3,694,000	19,741,000
Wythe	4,654,361	5,274,000	
Cities			
Bluefield, West Virginia		8,368,000	
Bristol, Tennessee		23,517,000	
Bristol		29,596,000	
Clifton Forge		1,164,000	
Covington		(D)	
Galax		16,412,000	
Norton		1,053,000	
Radford		14,239,000	
Roanoke		57,371,000	

⁽D) - Figures withheld to avoid disclosure.

SOURCE: Bureau of the Census, 1964 Census of Agriculture; 1963 Census of Business; and 1963 Census of Manufacturing.

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	Total			Per Cent Employed In			% of Labo
Area	Employment	Agriculture	Mining	Manufacturing	Trade	Services	Unemplo
	0		1	6.1.2	13 3	7.9	2.7
Alleghany-Clitton Forge-Covington	12,110	7.1		4.11			
Rath	2.087	14.0		8.7	5.3	4.1	3.3
Rland	1,440	28.5	,	38.7	3.7	2.0	3.6
S T T T T T T T T T T T T T T T T T T T	3.682	20.0	6.5	21.6	8.9	3.6	8.7
Borecour	8 532	2.0	51.8	2.6	10.4	5.6	4.5
buchanan	15,222	16.2		64.0	10.0	4.1	4.7
Carroll-brayson-carax	27,01	21.0	•	20.1	4.7	2.0	7.7
Craig	3 87%	3.4	51.6	5.0	8.1	2.5	7.0
Dickenson	2,327	26.0		27.2	7.0	3.8	4.3
Floyd	6,50	6.52		51.7	10.8	5.3	2.5
Giles	1,070	28.3		16.6	9.4	4.1	2.3
Highland	7,366	38.4	9.9	1.3	10.3	5.4	0.6
Tree	1,50	2		41 4	0	6.1	1.9
Pulaski-Montgomery-Radiord	32,637	7:0	. 1	21.6	20 4	12.6	2.3
Roanoke County and City	78,340		1, 2,	12.3		7 1	0.9
Russell	5,516	32.0	1.01	7.71	7.0		0 0
Scott	4,384	42.2	0.6	7.9	10.5	0.4	0.0
Smyth	10,157	11.1		40.7	10.7	8.0	5.8
Tazoza11	11,578	6.9	12.2	20.0	18.2	10.1	5.2
Usehington-Briefol	19,656	13.2		29.5	15.4	10.5	3.1
Masiling Con-Diasor	10 840	2.2	18.9	8.8	17.5	10.3	9.9
WISE-NOI COIL	0+0,01	1			101	0 -	2 7
Wythe	7,332	14.4	2.5	21.3	17.4	0.7	7.7
United States	1	5.5	8.6	30.0	20.7	15.0	3.8
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SOURCE: Virginia Employment Commission and Bureau of Labor Statistics.

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TABLE 17

Provisional Estimates of Personal Income

	<u>P</u>	er Capita Per	sonal Income, 1965	% Change in Total Personal
			% of State	Income
Counties		Amount	Average	1960-65
Alleghany		2,171	90	48.4
Bath		1,641	68	20.5
Bland		1,217	50	23.7
Botetourt		1,738	72	34.4
Buchanan		1,069	44	16.5
Carroll		1,469	61	52.6
Craig		1,665	69	48.6
Dickenson		1,012	42	- 3.8
Floyd		1,584	66	48.2
Giles		1,891	78	39.0
Grayson		1,466	61	37.0
Highland		1,315	54	18.7
Lee		899	37	10.4
Montgomery		1,996	83	45.3
Pulaski		1,939	80	40.0
Roanoke		2,615	108	58.5
Russell		1,186	49	14.6
Scott		1,180	49	20.3
Smyth		1,473	61	13.3
Tazewell		1,565	65	24.6
Washington		1,514	63	40.2
Wise		1,296	54	5.4
Wythe		1,573	65	43.4
All Virginia C	Counties	2,359	98	52.7
Cities				
Bristol		1,849	77	8.7
Clifton Forge		2,400	99	37.5
Covington		2,446	101	11.6
Galax		1,948	81	- 9.0
Norton		1,626	67	7.4
Radford		2,309	96	42.1
Roanoke		2,244	93	13.5
All Virginia C	ities	2,495	103	36.8
State		2,413	100	45.7

SOURCE: Bureau of Population and Economic Research, Univ. of Virginia.

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TABLE 18

Average Annual Per Cent Change in Population of Growth Areas 1950-60, 1960-65, and Projected 1965-70

Growth Area	1950-60	1960-65	1965-70
Bristol-Abingdon	+0.9	+0.9	+1.5
Buchanan-Roanoke	+1.5	+1.9	+2.2
Covington-Clifton Forge	3	+ .3	+ .6
Duffield-Wise	-1.5	9	7
Galax-Hillsville	5	+ .4	+1.8
Lebanon-Bluefield	5	+ .1	+1.0
Marion-Wytheville	2	+ .7	+1.2
Pulaski-Narrows	+ .2	+1.3	+2.5

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SOURCE: 1950-60 from Table 9; 1960-65 calculated from County and City estimates of the Virginia Bureau of Population and Economic Research; 1965-70 calculated from Table 12.

New Manufacturing Plants Located from 1960 through 1966 and Average 1966 Employment in those Plants

Growth Area*/	No. of Plants	1966 Employment
Bristol-Abingdon	4	235
Buchanan-Roanoke	17	2,010
Covington-Clifton Forge	3	2,005
Duffield-Wise	2	95
Galax-Hillsville	7	620
Lebanon-Bluefield	6	770
Marion-Wytheville	5	990
Pulaski-Narrows	9	1,350

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^{*/} Portion located in Virginia.

SOURCE: John H. Hunter, New Manufacturing Plants in Virginia since 1960 (Virginia Division of Industrial Development, 1967).

New Manufacturing Plants Located from 1960 through 1966 and Average Employment, 1966

	No. of	
Counties	Plants	Employment 1966
Alleghany	2	150
Bath	-	
Bland	1	15
Botetourt	3	110
Buchanan	1	100
Carroll	5	445
Craig	- ·	
Dickenson	-	The second second
Floyd	2	175
Giles	2	170
Grayson		Tabalianid-s-modal
Highland	1	95
Lee		Surke - Nychard ha
Pulaski	2	805
Russell	1	160
Scott	1	5
Smyth	1	140
Tazewell	5	610
Washington	3	215
Wise		
Wythe	3	835
Cities		
Bristol	1	20
Clifton Forge		
Covington	1	1,855
Galax	10 - 15 14 15 15 17 - 1 1 11 15	
Norton	1	. 90
Virginia Appalachia	36	5,995
State	339	35,225

SOURCE: Virginia Division of Industrial Development.

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Ratio of Local Employment to Export Employment, 1965

		1965 Employme	nt
Area	Local	Export	Ratio
Alleghany-Covington-Clifton Forge $\frac{1}{}$	5,325	5,202	1.02
Bath	710	1,350	.53
Bland	488	1,076	.36
Botetourt-Roanoke	44,071	33,766	1.31
Buchanan	3,575	4,803	.74
Carroll-Grayson-Galax	6,925	9,893	.70
Craig	429	292	1.47
Dickenson	1,982	2,372	.84
Floyd	1,122	1,316	.85
Giles	2,855	3,745	.76
Highland	563	582	.97
Lee	2,476	2,595	.95
Pulaski-Montgomery-Radford2/	14,000	17,700	.79
Russell	3,370	3,440	.98
Scott	2,196	3,574	.89
Smyth	4,089	5,285	.77
Tazewell3/	7,315	5,300	1.38
Washington-Bristol	9,509	9,998	.95
Wise-Norton	6,902	4,491	1.54
Wythe	4,405	3,524	1.25
TOTAL	122,307	120,304	1.02
State			1.24

SOURCE: Virginia Division of Planning.

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^{1/ 1964} data.

 $[\]frac{1}{2}$ / 1966 data (preliminary estimates).

 $[\]frac{2}{3}$ / Based on place of residence (others on place of work).

Number of Practicing Physicians and Dentists, 1967

Counties	Physicians	Dentists
Bath	4	1
Bland	. 1	1
Botetourt	8	4
Buchanan	9	4
Carrol1	4	4
Craig	1	0
Dickenson	6	2
Floyd	2	2 2 3
Giles	9	3
Grayson	5	1
Highland	1	1
Lee	7	2
Pulaski	22	2 5 2 5 7
Russel1	4	2
Scott	6	5
Smyth	14	
Tazewell	26	9 7
Washington	27	7
Wise-Norton	20 to 25	7
Wythe	10	5
Cities		
Bristol	55	26
Clifton Forge	12	3
Galax	12	5

SOURCE: Virginia Division of Planning, Economic Opportunity Section.

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Maximum Section 214 Grants as a Per Cent of Total Eligible Project Costs

	Per Cent
Outdoor Recreation	30
Sewage Treatment	50
Vocational Education	30
Libraries	21.77
Airports	30
Educational Television	30
Hospitals	25
Community Colleges	40
Other Higher Education Institutions	46.67
Watershed Protection	30

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 13
WEST VIRGINIA WATER SUPPLEMENT

Prepared by
The West Virginia State Departments of Natural Resources
and
Commerce

1968

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DEPARTMENT OF THE ARMY OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS REPORT FOR DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V STATE WATER SUPPLEMENTS

CHAPTER 3 WEST VIRGINIA WATER SUPPLEMENT

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I. INTRODUCTION

West Virginia Appalachian Guidelines - 1967-68

The Appalachian Regional Development Act of 1965 has proved itself - not only as a mechanism for the economic rejuvenation of the Appalachian area, but as an instrument for creating a new and unique partnership between the federal government and the states.

We sincerely believe that this is the most dramatic and successful of the ventures in "Creative Federalism" which has been a keynote of many of the programs initiated and brought forward under the forceful and effective leadership of President Lyndon B. Johnson.

The Appalachian Region and West Virginia are emerging from the doldrums which afflicted our area for so long. But our rate of growth still is not as fast, in some areas, as the national economy as a Whole.

The Appalachian Regional Development Act was never foreseen as a short-run panacea or an economic cureall. It has been a deliberately-conceived, long-term effort to make public investments in the Region which will bring our area fully into step with the rest of the country - to enable it to share equally in growth.

The program is not intended to do - nor will it do - the complete job - but it is a powerful ally to help the states and their people toward this goal of full participation in our national progress. Because the Appalachian concept goes to the heart of our many problems, it gives us additional tools to remove these long-standing barriers to development. The major problems towering head and shoulders above all others have been accessibility, education, health, and infra-structure development.

We are most gratified to say that the states and the federal establishment have cooperated extremely well. Each state, showing a spirit of genuine regional consciousness and cooperation, has developed its own investment strategy - designed to place projects in the areas where future economic growth can be clearly forecast, based on all the indicators we can assemble at this time.

Thus, the Appalachian program has caused each of us to take stock of our State, our resources, our people, in a new way. West Virginia was given the difficult task of assessing its assets and liabilities, and bringing forth an investment strategy for Appalachian programs. This activity has worked so well that we are now using our "blueprint for public investment" for more than Appalachian activity alone. These criteria are now being applied to private activities and state-supported endeavors, as well. And, aligned carefully with the

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delineation of these growth patterns in West Virginia, we have put into action a team of development specialists, who cooperates closely with private citizens and local governments in planning new approaches to bringing in new industry, strengthening educational and cultural activities, and utilizing the most modern forms of technology to plan and build economic stability into each section of our State.

In West Virginia, where virtually no planning on the extensive developmental highway system allocated to us under this Act could take place until the Appalachian Act was passed in 1965, we have obtained approval for 425.8 miles of developmental highway corridors, as well as 63.2 miles of local access roads. Contracts have been let in the amount of \$12,905,230 on developmental highways and an additional \$1,501,000 for local access roads.

Education has been given an equally high priority rating in West Virginia. We have invested about \$8.4 million in funds available to us under the supplemental grant-in-aid program provided in Section 214. Fifty project applications have been approved to date. But this has triggered more than \$43.2 million in public investments in West Virginia - with 27 of these projects devoted to education, including: Twelve new college teaching facilities; seven public libraries; development of a complete new branch college; five regional vocational training centers, and two educational television stations.

Also of major importance in our State has been the provision of better health and sanitation facilities. We have provided Appalachian funds for 15 projects to improve the health care of our people - including our first community mental health care centers and community centers for the care of the retarded. A total Appalachian investment of \$2.3 million has stimulated approximately \$11 million of total investment in much-needed health facilities.

Aviation is one of our fastest growing industries in West Virginia with a growth rate of over 300 percent in the last 10 years. The Appalachian Program has contributed to this growth rate by enabling six new airports to be constructed with Appalachian funds.

Our land stabilization program, which is varied in nature, has been a tremendous success within the limited funds available. The Counties of Barbour, Braxton, Grant, Mineral, Monroe, Pendleton, Preston, Roane, Summers and Wirt have benefited from a \$898,000 land stabilization and erosion control program which has been recognized as a model for other Appalachian states. West Virginia is also receiving the benefit of a comprehensive water resource study under a \$5,000,000 allocation to the U.S. Corps of Engineers.

Our mine restoration program has proven itself in areas where it could be fully utilized. In West Virginia, however, only a few acres of eligible land are publicly-owned, and our efforts were therefore

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restricted. It is hoped that the proposed change in the current legislation will allow greater participation under this section.

These programs and projects have enabled us to continue a more aggresive campaign to keep West Virginia moving forward.

The succeeding sections of our West Virginia Appalachian Guidelines will present our strategy for public investment based upon the best understanding of our economy. Planning is not an end in itself, but a means to an end. In terms of governmental activity, better planning can be utilized to make more effective investment decisions.

The 1965-67 effort to integrate West Virginia's Appalachian Regional Development Program with statewide program planning and public investment analysis will continue during 1967-68. During the past year, notable progress has been made toward this goal. The next year's effort is expected to result in significant refinements in development strategy regarding public investment locations, intergovernmental relations and functional program planning.

The 1967-68 strategy for analysis of the West Virginia Appalachian Guidelines is cutlined in the chart on the opposite page. Also included on that chart are the interrelated commission studies.

The following chapter provides additional information on anticipated results of the 1967-68 strategy for analysis.

II. STRATEGY FOR PROGRAM PLANNING AND PUBLIC INVESTMENT ANALYSIS

Criteria of Act and Standards of Administration

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Previous work provided an invaluable opportunity for the State and its localities to become familiar with and test the variety of programs available through participation in the Appalachian Regional Development program. Continuing analysis in this area will build upon that experience and expand understanding of additional intergovernmental programs as they relate to one another and to the goal of development.

Direct and indirect programs through the Appalachian program will be evaluated on the basis of past experience as to their relative potentials in stimulating social and economic growth, a reinforced infra-structure and a more desirable environment.

In addition, a detailed review of all Federal-State programs and direct state actions will be completed by early fall. It will include an interpretation of intergovernmental implications by program groupings

	STRATEGY FOR PROGRAM PLANNING AND PUBLIC INVES	THENT ANALYSIS
Criteria of Act and Standards of Administration	1965-1967 Determination of Programs and Projects Applicable to West Virginia	A. Continuing analysis of program opportunities and evaluation of alternatives. B. Detailed review of Federal-State programs and actions with interpretation of intergovernment implications (catalogue and related analysis)
II. Basic Information and Analysia	Preliminary analysis projected to 1970 - 1975. Population and human resources Economic base Land resources and development Infrastructure	A. Population, Economy-Mangover, State and Local Finance, Intergovernmental Pelations, Lend-Use Change and Development, Transportation, Program and Folicy Review B. Planning Information and Data Systems - Public Expenditure System - Land-Use System - Tax System
	Commission Studies: A. Public Facilities Inventory B. Regional & County Profiles C. Shift Analysis for the Sub- regions - Employment D. Data Survey	Commission Studies: A. Geophysical Survey B. Strip Mining Studies C. Tinber Studies D. Water Pollution E. Acid Mine Drainage F. Air Pollution
II. Locational Investment Analysis and Framework for Regional Investment.	Analysis of Regional Framework for Development Input-Output Analysis	A. Model of Local Tax and Expenditure Efforts B. Patterns of Expenditures, 1980-1965: Levels of Service Local Efforts Interpoverne untal Transfers Locational Fatterns Developmental Effocts Historical Chengs. C. Analysis and Text Model of Public Service Economies of Scale. D. Transportation Implications: Economic Change Single or Multi-Investments: Locational Implications within Regions E. Regional Analysis of Land-Use Change and Development. F. Imput-Output Analysis
	Commission Studies: A. Guidelines for an Appalachian Airport System, Phase I & If. Management and Economic Research Incorporated.	Commission Studies: A. Highway Plan a. Impact Studies b. Need Studies
V. Program Development Planning (FPP)		A, Muman Resources Development Program — Comprehensive Health Planning — Comprehensive Education Program — B. Land and Water Resource Development Program — Water Resource Development Planning — State Recreation Development Planning — Land Reclamation Planning C. Mousing and Environmental Service Development D. Economic and Industrial Development — Hanpower Development Planning — Private Capital Investment and Service Requirements E. FPP Information System Development
	Commission Studies: A. The Appalachian Location Research Studies Program - The Fantua Co., Inc. B. Recreation as an Industry - Robert R. Nathan Arsm., Inc. C. Preliminary Analysis for Economic Development Plan for the Appalachian Region - Litton Industries D. Plan of Survey for Development of Water Resources in Appalachia.	Commission Studies: A. Water Development Plan B. Comprehensive Health Needs C. Comprehensive Health Project Weeds D. Comprehensive Education Needs
V. Policy Evaluation and Investment Criteria	Determination of growth areas Evaluation of problems and potential of state investment package	A. Functional program planning determinants of program allocations B. Local tax and expenditure efforts in determination of program allocations C. Social Implications for public policy development. Public service and facilities economies of scale
C. Organization and Administration	Development and organization plans and procedures Implementation of local development district offices	A. Establishment of local Development Districts Economic Development Districts B. Standards for general purpose regional districts C. Allocation and evaluation of project development

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to assist state and local government personnel in their evaluation of program alternatives and approaches to implementation.

Basic Information and Analysis

The development of basic data and information on a variety of development problems has been underway throughout the 1965-67 period. This work has included population, economic structure, regional profiles, land resource development, water, social values and several functional program areas including housing, health, and transportation. Of particular long-term importance has been the development of public expenditure data which is now near completion.

During the 1967-68 period, particular attention will be given to information regarding manpower development, state and local finance, intergovernmental relations, land-use change and development, factors which determine the location of transportation facilities, and program and policy review. Methods of keeping the information current are being refined as are analytic methods and criteria for investment.

Regional Investment Analysis and Framework for Regional Investment

The period 1965-67 provided basic regional conceptualization, data development and certain changes of governmental orientation toward regionalization. It is anticipated that the 1967-68 period will see fundamental changes in understanding the implications of public facility locations and patterns of public expenditures as they relate to regional development and efficient use of resources.

A recently completed preliminary analysis of the patterns of local government expenditures provided an evaluation of local government effort in development. It also established the characteristics of local governments as they relate to a measure of effort. This study is being supplemented by an evaluation of local tax efforts in an accurate formula for the measurement of local effort, ability and need for intergovernmental assistance.

Upon completion of the public expenditure data development, detailed analysis of the patterns and character of public expenditures by location in West Virginia from 1950 to 1965 will be prepared. This work is expected to reveal relative levels of service, local effort, intergovernmental transfers, locational patterns, possible developmental effects and historical change. The results will have a direct influence upon program development planning and policy evaluation and investment criteria. The system is designed for periodic monitoring and testing of development implications.

A mathematical framework for a test region is nearly completed

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which will be used to determine where public services could be operated more economically if consolidated into enlarged service areas, or in economic terms, where economies of scale can be achieved. The framework applies economic criteria to achieve efficient provision of public services in West Virginia and to measure the intergovernmental cost and benefits which would be derived from a more efficient allocation of functional responsibility.

Using a broad definition of "scale economies" which includes both the direct and administrative costs of providing public services, the model will assign responsibility for the provision of such services to municipal, county, regional and state governments in such a manner as to minimize the total cost of achieving the desired level of output. The basis for distributing the functions among the various governmental levels was provided by the following economic criteria: (1) the extent of the area benefiting from the provision of a particular public service; (2) the invluence of the size of the geographic area served and the degree of population concentration, on the cost of providing the function; and (3) the extent to which growth in one governmental jurisdiction may occasion costs for one or more neighboring jurisdictions.

Transportation development implications for the nine regions are being developed from two approaches. The first is an analytic scheme to measure the anticipated economic changes occasioned by the interstate and development highway systems. It is designed to establish the relationships which exist between major non-West Virginia metropolitan hubs and West Virginia economic regions.

The second approach deals with intra-regional movements before and after the future highway system as they affect the location of one or several regional public facilities. If the model is successful, it will be applied to each economic region to establish the transportation factors determining the location of major capital facilities.

In addition to the development of land-use data, analysis is in process on a monitoring system with particular emphasis on urban areas, major recreation areas and interstate and development corridors. Preliminary evaluations of land-use change, development and potential will be prepared for each region.

Program Development Planning (FPP)

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The period 1965-67 established the basis for functional program planning in West Virginia. Interrelated programs in health, housing, education and natural resources were begun. The major procedures for functional program planning were developed in three reports dealing with the conceptual framework, Department of Commerce pilot test and installation strategy.

The implementation of functional program planning in a variety of areas will be one of the major tasks during 1967-68.

A human resources development program will be of primary importance. Although this area is perhps the most interrelated and complex of all public service groupings, major attention will be given to health and education programs.

In education programming, basic analysis will focus on a general assessment of public education problems, patterns and responsibilities for education expenditures and the role of intergovernmental coordination in education problems, patterns and responsibilities for education expenditures and the role of intergovernmental coordination in education development. It is expected that the following public program guidelines will result: (1) A state-sponsored incentive program for school construction; (2) Basic guidelines for public investment in vocational and technical education as they relate to the development of regional training programs and state-local capital improvements planning; and (3) A reassessment of the statewide use and programming of educational television capacities.

Health planning will develop a statewide system of regional health facilities and services based upon the developing experience resulting from the Governor's Task Force on Health, interdepartmental coordination and regional citizen-participation.

Planning for the development of water and recreation resources and for the reclamation of land resources comprise the three major efforts of the land and water resource development program for 1967-68. Information developed during the state development planning process will be utilized in revising the statewide recreation plan to meet the requirements of the Bureau of Outdoor Recreation. Land reclamation planning has become increasingly important for the development of state programs following the passage of the new state strip mining regulation law and the imminent completion of the Department of Interior's regional study and recommendations.

Housing and environmental services development analysis has been in process for several years. With the completion of studies by the Governor's Task Force on Housing and the State Development Plan, action programming will be conducted in cooperation with the Appalachian Regional Commission to implement recommendations and develop policy guidelines for further program development.

Economic and industrial development programming will be in preparation during 1967-68 as a synthesis of other program elements and public investment analysis. Special attention is being given to manpower development planning through educational and related programming and to patterns of private capital investment and service requirements.

Of particular importance to all programming elements is the development of the functional program planning information system. It will serve and interrelate all state and federal program areas. Work is in process on the information system and will result in a comprehensive program and policy review by the end of 1967.

Policy Evaluation and Investment Criteria

During the 1965-67 period, a standard pattern of nine economic regions of West Virginia were developed and implemented as standard administrative areas for a variety of intergovernmental programs including the Appalachian Regional Development Act. Basic analysis of the regions evaluated development potentials and established guidelines for public investment.

A series of related efforts are now underway to supplement previous development information and to more accurately evaluate alternative investment possibilities. It is expected that this work will provide an expanded basis for policy evaluation and investment criteria in development programs.

The results, recommendations and alternatives identified in individual program development planning will be grouped to determine relative priorities and locational requirements among programs. These will be interpreted with regard to explicit policy evaluation and investment criteria.

The results of the measures of relative local tax and expenditure efforts by local government and locational characteristics will be interpreted as they relate to the determination of program allocations.

The recently completed study of selected social implications for public policy development in West Virginia provided additional information for development programming. This information will be supplemented by additional data on private sector interests in developmental policy and by a more accurate assessment of the trends in private capital expenditures as they require public investment. The conclusions of this analysis will result in explicit criteria in evaluating investment decisions.

Finally, the results of the locational investment analysis and framework for regional investment will be interpreted as they relate to investment criteria. It is anticipated that new information on public service and facilities economies of scale will be of major importance to investment criteria.

Organization and Implementation

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Regional development offices in the West Virginia regions were established in 1965-67. They have provided a critical focus for local and multi-county development efforts.

During 1967-68, development standards will be completed for greater participation and decision by local governments in regional development. It is expected that these regional units will plan an increasingly important role in state-local development efforts and in the effective implementation of higher infra-structure standards resulting from federal-state-local programs.

III. LOCATIONAL ANALYSIS - WEST VIRGINIA PUBLIC INVESTMENT STRATEGY

The Appalachian Regional Development Act and its emphasis upon public investment strategies has had an effect upon the investment decisions of the past year. The map and overlays - found in the Regional Analysis Section of this document - are specifically indicative of the coordination between funded ARC programs and the Supplemental, Developmental and Complementary Investment Areas. Although coordination is already evident, the total intended coordination in regard to functional program planning and the State Plan has not yet been achieved. Subsequent development of the Investment Criteria, Functional Program Planning, the State Plan and an adequate monitoring and administration system will achieve coordination of the complexity necessary to the fulfillment of the intention of the Act, the desires of the State and the needs of the regions of the State.

West Virginia's public investment strategy is predicated upon the growth point concept of regional development. This basic strategy has resulted in the delineation of nine development regions for the following reasons:

- 1. To provide a geographical framework for regional planning, analysis and action which is required by several new Federal programs and desired by the State so that a rationalized investment strategy would maximize the effect of expenditures of both levels of government.
- 2. To provide a common set of State administrative districts for various departments and agencies.
- 3. To provide a geographical sub-system of West Virginia for analysis of the unique problems and development opportunities in the preparation of state-local development policy.
- 4. To provide a standard framework for multi-county and regional cooperation in development to give guidance to join efforts by local units of government.

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5. To provide the basis for an information system on development activities within economic sub-regions of West Virginia.

The regional delineations were based upon a set of criteria which related to social, political, economic and physical activities. The primary emphasis was given to economic activity and its relationship to local and state governmental jurisdictions. The criteria utilized for this delineation included the following:

- 1. Retail sales areas, measured by consumer buying habits and by the ratio of retail sales in urban centers to total area population;
- 2. banking service areas as determined by geographic distribution of accounts and transactions;
- 3. communication links indicated by telephone call zones, and radio and television links by origin or response to advertising and programs;
- 4. health facility service areas as measured by origin of patients;
- 5. high school or college service areas as determined by origin of students;
- 6. labor market areas as determined by the distance over which employees are attracted to places of employment;
- 7. transportation network that unites an area as demonstrated by location of roads, railroads, airports and waterways;
 - 8. public utility service areas for electric power and water;
- 9. common soil types or climate determining suitability for particular agricultural activities;
- 10. topographic features, such as a mountain valley, coastal plain, or peninsula, that are limiting factors in development or that impose a similar pattern of land use, transportation and development upon a wide area;
- 11. homogeneous resources, such as forest and recreational resources, that require joint action for utilization:
- 12. remoteness from major metropolitan centers, making development of a transportation system and marketing channels essential;
- 13. complimentary resources, such as ores, fuels and raw materials; and,

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14. state and federal establishments serving the area.

The result of this delineation was that the State of West Virginia was divided into nine development regions. The regions are characterized by common economic, social and cultural features which make them logical regions for development and program implementation. The development regions and their respective counties are presented in the following list:

Region 1	Region 2	Region 3
Boone Kanawha Putnam	Cabell Lincoln Mason Wayne	Calhoun Jackson Pleasants Ritchie Roane Tyler Wirt Wood
Region 4	Region 5	Region 6
Brooke Hancock Marshall Ohio Wetzel	Doddridge Gilmer Harrison Lewis Marion Monongalia Preston Taylor	Berkeley Grant Hampshire Hardy Jefferson Mineral Morgan Pendleton
Region 7	Region 8	Region 9
Barbour Braxton Clay Greenbrier Nicholas Pocahontas Randolph Tucker Upshur Webster	Fayette Mercer Monroe Raleigh Summers	Logan McDowell Mingo Wyoming

The second major component of this strategy is a classification system of the types of investment areas. The three types of areas are

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as follows: (1) supplemental investment areas; (2) developmental investment areas; and (3) complementary investment areas. This classification is based upon the identification of growth points as nuclei of sustained growth from which the impulses of development are to be transmitted to other regions, especially the immediate surrounding areas. From this basic idea of growth point, the three types of investment areas were developed.

Supplemental Investment Areas (SIA) are, essentially, the center or nucleus of economic development in the regions. The center should have one or more economic activities that have shown signs of sustained growth over a period of time and that could be reinforced to create capacity for further development in the region.

In order to capitalize upon what already exists and assure the maximum return for the public dollars invested, is to build upon and enlarge some existing urban centers and clusters of centers in order to make them attractive to new investment and service the surrounding rural areas. This strategy is also applicable to peripheral areas surrounding the urban centers. This strategy capitalizes on existing bases of urbanization and their inventory of public and private facilities. It requires that (a) the centers themselves expand and have the economic potential for expansion; (b) that developable land for this purpose be immediately adjacent; (c) that public and private facility investments adequate to serve their enlarged employment base be made; and (d) that intergovernmental arrangements permit the planning for the urban-rural areas the centers are designed to serve.

In determining where substantially increased economic and social activity can be induced, several conditions must be met. Developable land is a necessary condition; but, alone, it is not enough. In addition, judgment must suggest that an adequate base of economic potential, public facility availability, population, and service area exist. The population and service area should be adequate to warrant the scale of investment needed to create viable centers, and the centers have to offer prospects of supporting the range of employment and services the population and area require.

The clustering of economic, social and education activities not only provides reinforcement to the growth point, but also lends stability to the region. While growing and expanding in one or more directions, the growth point should attempt to include, rather than exclude, other areas in the process of development. This "spread effect" helps induce the extension of the means of transportation and communication; increased opportunities for employment, investment and occupational mobility; expansion of markets; construction and renovation or modernization of existing housing structures; increased opportunities for education and training; and changes in the attitudes and motivation of the people toward growth. The spread effect may be intensive, with the existing units increasing their efforts to improve

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operation, or it may be extensive with new firms or new plants locating in the area.

Developmental Investment Areas (DIA) possess sources of strength but are not as highly developed in terms of the economic base or infra-structure as the Supplemental Investment Areas. In such situations, the appropriate strategy requires discovering the providing access to land for extension of the centers suitable for new residential commercial and industrial activities linked to the employment and service base of the existing centers. The same conditions and cautions apply as before, but added costs of access must appear warranted and the location of new investment must be carefully considered to determine which are most appropriate for placement in the newly opened extensions.

Improved means of communication, transportation, such as a major highway passing through the area, an intersection of highways, freight terminals, railroad junctions will make such areas more viable for economic development. Banking and financial institutions, scenic spots and tourist attractions, important fairs and festivals and availability of sites for the location of additional production units are some of the factors that provide reinforcement to these growth points. The availability of raw materials, nearness to markets, and location between or near the continuous chain of urbanization may also be considered as additional advantages for growth in the Developmental Investment Areas.

Region-serving facilities will most logically be located in the supplemental and developmental areas. So will more localized investments that enhance their attraction of still more enterprise and investment.

The third strategy involves recognition of the fact that not all of our counties or its population is within the reasonable service areas of the centers to which the foregoing strategies might be applied. Such areas are likely to be geographically large but without urban populations. Within these Complementary Investment Areas (CIA), the economic feasibility of providing as wide a range of public services as elsewhere is obviously constrained, but the general objective of increasing the availability of public services must still hold. To accomplish this requires a combination of innovations in the delivery of public services and the provision of improved access and mobility for the population. In these areas, efficiency of public services is limited by the population dispersion which may affect the quantity of services than can be made available, since economies of scale cannot be realized. The strategy for development for such areas is to help create competitive skills in the population in order to widen their range of opportunities and to structure public investments that have a durability and capacity commensurate with the area's long-run economic and social role.

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Selected opportunities may exist in these areas to create new centers. A strategy to accomplish this requires the most careful planning to assure that resources which might be diverted from existing locations of potential growth are justifiably expended. Conditions which warrant new center investments include such favorable competitive attractiveness that employment to support the projected population is extremely likely.

The final objective of each of these is to contribute to the rational development of the State so that cumulative effect will be:

First, to provide the people of West Virginia the health, skills and education necessary to enable them to compete for new opportunities; and, secondly, to develop the full potential of the West Virginia economy.

It should be evident that the concept of growth points will lead to specific, geographic concentration of public investment funds. It is, in fact, the express desire of our efforts in regional development to make these investments on a more thoroughly planned, more rationally conceived basis. The Regional Analysis Maps, with their overlays of ARC investments, are indicative of the success we are beginning to achieve; further successful development is expected in regard to the other facts of the strategy.

Although some investments have been allocated as our investment strategy indicated, the real success, that of actual sustained growth and stability in our regions and the provision of health, skills and education necessary to complete, largely remains to be effectuated. We do consider the accomplishments of the past year to be suggestive of that which might reasonably be expected to occur in the years to come.

IV. WEST VIRGINIA FEDERAL-STATE PROGRAM IMPLEMENTATION

The two major grant-in-aid programs recently approved by Congress, the Appalachian Regional Development Act of 1965 (PL 89-4) and the Public Works and Economic Development Act of 1965 (PL 89-136), have enabled the establishment of a Federal-State Programs Office to implement provisions of new Federal legislation to the communities of West Virginia.

In January, 1966, Section 302 of the Appalachian Regional Development Act was utilized in establishing the West Virginia Appalachian Development Office, a special project unit created by Governor Hulett C. Smith and assigned to the West Virginia Department of Commerce for

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implementation of the provisions of the Appalachian Program.

The West Virginia Economic Development Office was created on April 1, 1967, utilizing funds made available under the Public Works and Economic Development Act of 1965.

The establishment of both the West Virginia Appalachian and Economic Development Offices represented the first attempt by the State of West Virginia to take advantage on a coordinated basis of new legislation which has recently been enacted to emphasize regional development programs. Regional development offices have been established to provide information and technical assistance to local communities and county governments. As a result of this new service, many communities have been able to:

- 1. Learn of programs for which they could qualify;
- Be placed in contact with the proper agency to meet a community need;
- 3. Execute realistic and competent applications for federal funds; and $\ensuremath{\mathsf{S}}$
 - 4. Translate local needs into regional action.

The original Appalachian Development Act 302 grant provided for the establishment of only five field offices. However, the new 302 grant, combined with the Public Works and Economic Development Act grant, has enabled the State of West Virginia to establish a regional development office in each of the nine development regions.

Personnel within the regional development offices, during the past year, have been subjected to a wide variety of in-depth training on various Federal and State programs designed to upgrade the regions from an economic, cultural and educational standpoint. During this grant period and subsequent grant periods, expanded training sessions are planned to allow a more comprehensive understanding of guideline revisions in the various Federal programs available to the communities.

During the current phase of development, the regional development officers will be trained extensively in the process of creative thinking and creative problem-solving which will have a direct application to the human resource development of all West Virginia. Through this extensive training, it is anticipated than a new self-reliance can be instilled in many or all of the communities in West Virginia to the point whereby they will have sufficient local expertise, with a minimum of outside assistance, to solve their problems in a logical and competent manner based on local human resources, and practical application to regional needs.

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The Federal-State Programs Office, through its regional development offices, has made possible professional technical assistance and coordination of new legislation to insure that the State of West Virginia and her communities can take full advantage of available assistance. Such implementation represents one of the most significant developments in governmental service to local communities in the State of West Virginia.

It is anticipated that the Federal-State Programs Office and its regional development offices will be funded through a general revenue appropriation by the West Virginia Legislature. Thus, continuity of this important new service will be assured upon depletion of Federal grants for this purpose.

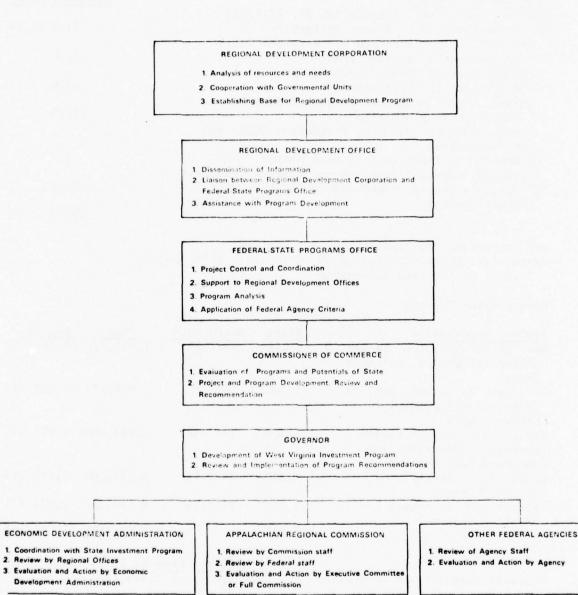
Regional Development Corporations

It is the intention of the State of West Virginia to assist also in the establishment of regional development corporations which would be broadly representative of the principal interests of the regions including county and municipal government, business, labor, agriculture, minority groups, unemployed and underemployed, transportation, education, health, planning, financial institutions and the communication media. These corporations will be private, non-profit, multicountry groups conforming to the State's nine development regions. They will be established for the purpose of promoting economic, environmental, educational, cultural and recreational growth.

Regional Development Corporations will be responsible for the following:

- 1. Assist in professional analysis of the region's resources, problems, needs and opportunities.
- 2. Stimulate developmental ideas by interesting citizens in the potentials for overall economic development and growth.
- 3. Formulate an effective program for comprehensive development; after evaluation, setting priorities, and scheduling a program of implementation.
- 4. Establish continuing dialogue and discussions with major groups and organizations within the region, including the broadest possible participation toward establishing goals and objectives.

WEST VIRGINIA FEDERAL-STATE PROGRAM IMPLEMENTATION



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V. STATUS REPORT ON WEST VIRGINIA APPALACHIAN FUNDS As of July 7, 1967

Section		
201	DEVELOPMENT HIGHWAYS	BPR Authorized
	Approved Corridors: (Resolution 30, 7/14/65)	
	"D" Parkersburg to I-79 near Bridgeport	77.1 miles
	(Wood, Ritchie, Doddridge and Harrison Cos.)	
	"E" Morgantown to Maryland Line	31.0
	(Monongalia and Preston Counties)	
	"G" Williamson to Charleston	83.8
	(Mingo, Logan, Boone and Kanawha Counties)	
	"H" Weston to Virginia Line	132.9
	(Lewis, Upshur, Randolph, Pendleton, Grant and	
	Hardy Counties)	
	"L" Beckley to Junction I-79 near Sutton	74.1
	(Raleigh, Fayette, Nicholas and Braxton Counties)	
	"Q" Virginia Line at Bluefield to Virginia Line	26.9
	(Mercer County)	
		425.8 miles
	777 1 1 1 1 1 1 1 7 7 7 1 1 1 1 1 1 1 1	
	BPR Authorized New Construction 415.9 miles	
	*Authorized Funds (Resolution 92, 8/10/66): \$253,088,000	
	31.807% of 12-state allocation	

Construction Letting:

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Project Description Sec. 50/13 (Sherwood) to Sec. 9 (Salem By-Pass) - Doddridge	Miles 2.468	Award Date 6-17-65	\$ 1,660,510	ARC 201 \$1,162,357
County Jct. Sec. 34 to Jct. Sec. 25 (Princeton-Bludfield) - Mercer County	1.700	1-17-66	866,770	606,739
Sec. 9 to W. Va. 23 (Salem By-Pass) - Doddridge and Harrison Counties	2.669	1-27-66	2,768,400	1,937,880
W. Va. 23 to Bristol - Harrison County	2.320	8- 5-66	3,133,200	2,193,219
Bristol to Wolf Summit Harrison County	3.317	9-28-66	4,476,350	2,238,175
	12.474		\$12,905,230	\$8,138,370
Projects Approved and Authorized			deral Funds S 9,144,196 \$	
Total Approved and Awarded	25	,931,639	17,282,566	8,649,073

$\frac{\text{Section}}{201}$

(Continued)

LOCAL ACCESS ROADS	(D1-+	70 2/0/66	62 276	.1
Approved Mileage		70, 3/9/66):	63,276 m	rres
Initial allocated funds Additional allocation	(Resolution	12, 5/12/65):	\$ 612,500 553,664	
Additional allocation	(Kesolution	70, 3/9/66):	333,004	
*TOTAL ALLOCATION TO DATE			\$1,166,164	
Approved Projects	Miles	Total	ARC 201-B	
Long Point Recreation Area	1.80	\$ 300,000	\$ 126,000	
(Nicholas County - 7)				
Grandview State Park	2.70	476,000	189,000	
(Raleigh County - 8)				
Sherwood Lake	10.60	325,000	227,500	
(Greenbrier County - 7)	0.76	250 000	245 000	
Salem College (Harrison County - 5)	0.76	350,000	245,000	
Glenville State College	0.20	50,000	35,000	
Gilmer County - 5)	0.20	30,000	33,000	
321e. 334e, 3,	16.06	\$1,501,000	\$ 822,500	
Construction Letting:				
Project Description	Miles	Award Date	Total	
Long Point Recreation Area	1.7	2-21-66	\$ 220,000	
(Nicholas County - 7)				
Dandina Danisaka	W: 1	Total	ADC 201 P	
Pending Projects Airco Arroyo Industrial Site	$\frac{\text{Miles}}{0.62}$	$\begin{array}{c} $	$\frac{ARC}{\$}$ 201-B $\frac{24,500}{\$}$	
(Hancock County - 4)	0.02	3 33,000	\$ 24,500	
Kinney Shoe Factory	0.20	12,500	8,750	
(Hampshire County - 6)	0.20	12,300	0,.50	
Wheeling-Chio County Airport/	1.01	400,000	280,000	
Valley Camp Coal Corporation				
(Ohio and Brook Counties - 4)			
Keyser Industrial Park	0.90	42,500	29,750	
(Mineral County - 6)			1 010 000	
	2.73	\$ 490,000	\$ 343,000	
	Wadaadaa	atad 1067	664	
	Undesign	ated 1967	004	

Section 202

REGIONAL HEALTH CENTERS

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No funds have been allocated to any state under this section to date. Project proposals are being prepared for West Virginia with the cooperation of the West Virginia Department of Health and Mental Health.

Section

203

Initial allocated funds Additional allocation	(Resolution (Resolution		\$ 600,000 298,000
*TOTAL ALLOCATION TO DATE 9.41% of 12-state allocation			\$ 898,000

Approved Projects:

Barbour County (7)	\$ 97,000	Pendleton County (6)	\$	120,000
Braxton County (7)	92,000	Preston County (5)		120,000
Grant County (6)	105,000	Roane County (3)		110,000
Mineral County (6)	50,000	Summers County (8)		60,000
Monroe County (8)	\$104,000	Wirt County (3)		40,000
	Barbour County (7) Braxton County (7) Grant County (6) Mineral County (6)	Barbour County (7) \$ 97,000 Braxton County (7) 92,000 Grant County (6) 105,000 Mineral County (6) 50,000	Barbour County (7) \$ 97,000 Pendleton County (6) Braxton County (7) 92,000 Preston County (5) Grant County (6) 105,000 Roane County (3) Mineral County (6) 50,000 Summers County (8)	Barbour County (7) \$ 97,000 Pendleton County (6) \$ Braxton County (7) 92,000 Preston County (5) Grant County (6) 105,000 Roane County (3) Mineral County (6) 50,000 Summers County (8)

TOTAL: \$898,000 - 1967 All Monies Designated

Section

204

TIMBER DEVELOPMENT

No funds have been allocated to any state under this section to date. Projects will be prepared for West Virginia upon receipt of the necessary criteria.

Section

205

MINING AREA RESTORATION

Possible projects to comply with "public ownership" criteria are being developed. Available funds are limited to 75 percent of project costs.

Section

206

WATER RESOURCES STUDY

\$5,000,000 allocated to the U.S. Army Corps of Engineers for a comprehensive study of water needs. West Virginia is the only state to be studied in all counties. Survey report scheduled to leave USACE on July 1, 1968, for congressional passage by December 31, 1968.

Section

211

VOCATIONAL EDUCATION

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Initial allocated funds	(Resolution 34,	8/18/65): \$	432,610
Additional allocation	(Resolution 60,	1/14/66):	432,610
Fund loan to Tennessee (8/30	/		- 253,000
Tennessee repayment (9/14/66	5)		+ 253,000
Additional allocation	(Resolution 95,	9/14/66):	432,640
Additional allocation	(Resolution 104,	11/30/66):	432,640
Fund exchange with Virginia	for Section 214 fu	nds (1/4/67)	- 800,000
*TOTAL ALLOCATION TO DATE		\$	930,500
10.816% of 12-state alloca	ation		

These funds are limited to 50% of project costs. Projects are being prepared in cooperation with the West Virginia Department of Education, Division of Vocational Education.

V-20- WVA

Approved Projects: Tri-County Vocational School Buckhannon - Upshur, Lewis	\$ \frac{\text{TOTAL}}{500,000}	ARC 211 \$ 250,000
and Barbour Counties (7,5) Brooke County Comprehensive High School	1,498,412	680,500
Cross Creek - Brooke County (4) Total	\$1,998,412 1967 All Moni	\$ 930,500 es Designated
	olution 34, 8/18/65 olution 105, 11/30/66	
Fund exchange with North Carolina f	or Section 214 funds (4/28/67): - 475,564
*TOTAL ALLOCATION TO DATE 9.351% of 12-state allocation		\$ 85,500
These funds are limited to 30% of p Water Pollution Control Act (PL-660 in cooperation with the West Virgin Division of Water Resources.). Projects are bein	g processed
Approved Projects: Colin-Anderson Center St. Mary's - Pleasants County (3)	\$ \frac{\text{TOTAL}}{100,000}	\$\frac{\text{ARC 212}}{30,000}
Lakin State Hospital Lakin - Mason County (2)	\$0,000 \$ 180,000	\$ 54,000
Pending Projects: Weston State Hospital Weston - Lewis County (5)	\$ 105,000	\$ 31,500
	1967 All Moni	es Designated
Additional allocation (Res Additional allocation (Res	olution 34, 8/18/65 olution 60, 1/14/66 olution 87, 7/13/66 olution 106, 11/30/66 or 214 funds (1/4/67) 212 for 214 funds (4/28/67)	+ 800,000 + 475,564
*TOTAL ALLOCATION TO DATE 9.679% of 12-state allocation	LIVA	\$9,534,772

 $\frac{\text{Section}}{212}$

 $\frac{\text{Section}}{214}$

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V-21-WVA

Approved Projects:		
HIGHER EDUCATION	TOTAL	ARC 214
Alderson-Broaddus College Science Hall Philippi - Barbour County (7)	\$1,000,000	\$ 234,000
W. Va. Wesleyan College Science Center Buckhannon - Upshur County (7)	1,960,965	250,612
West Liberty State College, Wheeling Center - Wheeling - Ohio County (4)	383,404	109,544
West Virginia Institute of Technology Engineering Classroom Building Montgomery - Fayette County (8)	1,803,630	153,630
W. Va. University Parkersburg Center Parkersburg - Wood County (3)	2,853,646	682,439
W. Va. University Education T.V. Morgantown - Monongalia County (5)	1,045,748	313,724
West Liberty College Fine Arts Bldg. West Liberty - Ohio County (4)	175,000	41,725
Glenville State College Classroom Bldg. Glenville - Gilmer County (5)	300,000	125,000
Morris Harvey College Phys. Ed. Bldg. Charleston - Kanawha County (1)	960,684	159,000
Bethany College Fine Arts Building Bethany - Brooke County (4)	719,475	99,695
Salem College Science Building	1,929,860	200,000
Salem - Harrison County (5) Bluefield State College Technical Science Hall	971,079	347,386
Bluefield - Mercer County (8) Marshall University Library Huntington - Cabell County (2)	2,034,515	80,745
W. Va. Wesleyan College Science Center - Overrun	697,940	165,000
Buckhannon - Upshur County (7)	1 5/0 000	100 000
Wheeling College Library Wheeling - Ohio County	1,549,930	100,000
Marshall University Educational T.V. Huntington - Cabell County (2)	1,028,920	308,676
Shepherd College Administration and Academic Buildings	626,218	72,118
Shepherdstown - Jefferson County (6)		
Total	\$20,041,014	\$3,443,294
HEALTH AND SANITATION		
Summersville Nursing Home Summersville - Nicholas County (7)	\$ 1,290,428	\$ 190,000
Summers County Hospital Hinton - Summers County (8)	1,810,276	380,521
Pleasant Valley Hospital Point Pleasant - Mason County (2)	1,147,850	344,355

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St. Barbara's Nursing Home Addition	210,192	50,000
Monongah - Marion County (5) Barboursville State Hospital Addition	160,662	48,199
Barboursville - Cabell County (2) Green Acres Mental Retardation Center	198,967	37,804
Lesage - Cabell County (2) Cabell County Mental Retardation Center	617,694	117,362
Huntington - Cabell County (2) Greenbrier County Nursing Home	966,500	200,000
Fairlea - Greenbrier County (7) Colin Anderson Center Sewage Treatment	100,000	50,000
St. Mary's ~ Pleasants County (3) Lakin State Hospital Sewage Treatment	80,000	40,000
Lakin - Mason County (2) McDowell County Public Health Center	300,000	90,000
Wilcoe - McDowell County (9) Hospital Development Corporation	2,200,000	330,000
Spencer - Roane County (3) Northern Panhandle Mental Health Center	895,661	170,176
Wheeling - Ohio County (4) Northern Panhandle Rehabilitation Center	622,169	154,965
Roney's Point - Ohio County (4) Summers County Hospital - Overrun	500,864	120,000
Hinton - Summers County (8) Total	11,101,263	\$2,323,382
ATDRONAG		
AIRPORTS	210 600	50 0/5
Mason County Airport \$ Point Pleasant - Mason County (2)	219,690	59,845
Greenbrier County Airport Maxwelton - Greenbrier County (7)	1,971,600	385,800
Tri-State Airport	248,560	74,568
Huntington-Wayne & Cabell Counties (2) Braxton County Airport	190,200	57,060
Sutton - Braxton County (7) Mingo County Airport	1,326,000	397,800
Williamson - Mingo County (9) Mason County Airport	43,910	19,235
Point Pleasant - Mason County (2) Braxton County Airport - Overrun	64,800	19,440
Sutton - Braxton County (7)	04,800	19,440
	4,064,760	\$1,013,748
PUBLIC LIBRARIES		
	1,374,437	\$ 249,460
Martinsburg Public Library Martinsburg - Berkeley County (6)	502,000	91,113
3		

V-23-WVA

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Public Libraries (Continued)

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Hampshire County Library \$ 302,447 Romney - Hampshire County (6)	\$ 51,000
Calhoun County Library 87,300	15,845
Grantsville - Calhoun County (3) Kingwood Public Library 196,000	35,574
Kingwood - Preston County (5) Barboursville Area Library 194,259	29,061
Barboursville - Cabell County (2) Randolph County Public Library 160,356 Elkins - Randolph County (7)	29,105
Total \$ 2,816,799	\$ 501,158
VOCATIONAL EDUCATION	
Mineral County Vocational	6 225 225
Center \$ 1,070,450	\$ 235,225
Keyser - Mineral County (6) Tri-County Vocational School 500,000	150,000
Buckhannon - Upshur, Lewis and	130,000
Barbour Counties (5, 7)	
Brooke County Comprehensive 1,498,412	369,000
High School	
Cross Creek - Brooke County (4)	
Greenbrier County Vocational 2,127,015	425,403
Schools	
Greenbrier County (7)	
Total \$ 5,195,877	\$1,179,628
HIGHER EDUCATION \$20,041,014	\$3,443,294
HEALTH AND SANITATION 11,101,263	2,323,382
AIRPORTS 4,064,760	1,013,748
PUBLIC LIBRARIES 2,816,799	501,158
VOCATIONAL EDUCATION 5,195,877	1,179,628
*TOTAL APPROVED TO DATE \$43,219,713	\$8,461,210
Pending Projects: HIGHER EDUCATION	
Potomac State College \$ 825,000	\$ 330,000
Academic Building	7 330,000
Keyser - Miner County (6)	
Alderson-Broaddus College 1,107,057	175,000
Physical Education Building	
Phillippi - Barbour County (7)	
Total \$ 1,932,057	\$ 505,000

Section				
214	Pending Projects: (Continued) HEALTH AND SANITATION)		
	Weston State Hospital	\$ 105,000	\$	52,500
	Weston - Lewis County (5)	1,064,738		319,421
	Martinsburg City Hospital Martinsburg - Berkeley Coun			319,421
	St. Francis Hospital Center	649,036		194,710
	for Extended Care Charleston - Kanawha (1)			
	Total	\$ 1,818,774	\$	566,631
	AIRPORTS			
	None			
	PUBLIC LIBRARIES			
	None			
	VOCATIONAL EDUCATION			
	None			
		TOTAL		ARC 214
	HIGHER EDUCATION HEALTH AND SANITATION	\$ 1,932,057	\$	505,000 566,631
	AIRPORTS	1,818,774		
	PUBLIC LIBRARIES			
	VOCATIONAL EDUCATION			
	*TOTAL PENDING TO DATE	\$ 3,750,831	\$	1,071,631
Section				
302-A	LOCAL DEVELOPMENT DISTRICTS	(Decelution 2	8/18/65):\$	ARC 302-A 161,600
	Initial allocated funds Additional allocation		99, 9/14/66):	48,465
	Additional allocation	(Resolution 10	07, 11/30/66):	145,395

*TOTAL ALLOCATION TO DATE

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10.77% of 12-state allocation

These funds are for 75% of the costs of administering the Appalachian Regional Development Act of 1965 (PL 89-4) in West Virginia. The initial allocation of \$161,600 has been obligated by 25% matching funds of \$53,866 from the Governor's Office for a total project cost of \$215,466. The current allocation of \$193,860 has been obligated by 25% matching funds of \$64,620 from the Governor's Office for a total project cost of \$258,480.

\$ 355,460

There was an unallocated balance of \$21,667 from the initial allocation. These funds were returned to the parent authorities, 75% federal - \$16,257.75 and 25% state - \$5,419.25. This money was maintained

within the state budget and was deducted proportionately from the total allocation for the current year.

The past funds have enabled a headquarter's staff in Charleston (Kanawha County) and field offices in (Wheeling - Ohio County - 4), Martinsburg (Berkeley County - 1), Elkins (Randolph County - 7), Huntington (Cabell County - 2), and Beckley (Raleigh County - 8).

Through the new allocation, in addition to the already-mentioned headquarter's offices, the Appalachian Development Office will establish other offices in Clarksburg and Summersville.

Se	ct	i	on	
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RESEARCH PROJECTS	ARC 302-B
1968 Research Programs Unincumbered Funds	\$ 80,775
TOTAL OBLIGATED FUNDS Total Project Cost Section	ARC Funds
201 Development Highways \$25,931,639	\$17,282,566
Local Access Roads 1,501,000	822,500
203 Land Conservation 898,000	898,000

Vocational Education		930,500	
Sewage Treatment		54,000	
Supplements to Federal Grants	43,219,713	8,461,210	
Local Development Districts	452,279	339,202	
TOTAL	\$72,002,631	\$28.787.978	

July 7, 1967

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302

Paul R. Hutchinson, Jr. Director

VI. WEST VIRGINIA WATER RESOURCES DEVELOPMENT AND POLLUTION CONTROL

West Virginia's water resources activities have greatly increased both in water pollution control and water resources development. One of the more important activities, in water resources development, is the flood-plain studies. These studies are prepared by the U.S. Army Corps of Engineers and coordinated with the state. Flood plain information reports are prepared upon request of state and local agencies to delineate flood problems in communities throughout the state. At the present time West Virginia has one study underway at Milton, West Virginia. To insure that the most urgent needs are met first, the state in cooperation with the Corps of Engineers, is preparing a priority list of communities that will receive this service.

Included in this service is technical assistance to local government in evaluating and using flood data in making individual decisions concerning flood hazards. Pamphlets and guides pertaining to flood plain regulations, flood proofing, and other related activities are prepared for use by local authorities in planning and taking action to reduce flood damage.

West Virginia receives considerable water from the upper reaches of the Ohio River, which represents drainage from western Pennsylvania and parts of New York and Ohio. The average flow of the river shortly after entering West Virginia in the vicinity of Wheeling, is about $26\frac{1}{2}$ b.g.d. which exceeds the runoff provided within the state by $2\frac{1}{2}$ b.g.d. However, a substantial amount of water is contributed to the Ohio River by the Monongahela River which drains the northern reaches of the state. Smaller streams contribute some water to the state. The New River, a major headwater to the Kanawha River, brings in about 3.2 b.g.d. from North Carolina and Virginia. The South Branch of the Potomac also receives a small portion from Virginia. Thus, in its runoff and water brought in by interstate streams, West Virginia has a large surface water supply averaging about 49 b.g.d.

The vast amount of water available for use in the state is controlled by four federal flood control structures and water conservation reservoirs, at a construction cost of \$130,000,000.00. They are the Tygart Lake on Tygart River at Grafton; Bluestone Lake on New River at Hinton; Sutton Lake on Elk River at Sutton, and Summersville Lake on Gauley River near Summersville. Construction has started on East Lynn Lake on East Fork of Twelvepole Creek near Huntington, and the R. D. Bailey Lake on Guyandot River near Justice. Construction is anticipated soon on the Rowlesburg Lake, Beech Fork Lake on Beech Fork of Twelvepole Creek near Huntington, and six additional sites are planned for development.

West Virginia, with an annual precipitation of 43 to 45 inches and up to 60 inches in the mountains, has 17 drainage basins with 6 water-

sheds having an area greater than 1,500 square miles. West Virginia's annual runoff, averaging about 19 inches, is greater than that of the adjacent parts of bordering states because of West Virginia's lower average temperature and greater precipitation.

Many mineral constituents are found in varying amounts in the surface waters of West Virginia. The dissolved solids, hardness, sulfate, iron and manganese content of water usually determines the value of the water for general uses.

Surface water of West Virginia generally contains less than 250 ppm of dissolved solids but at times the dissolved solids exceeds 500 ppm in nearly every drainage basin. The lower portion of the West Fork River basin exceeds 500 ppm a large percentage of the time. Dissolved solids concentration in excess of 500 ppm have been found in the Tug Fork, Guyandot River and Wheeling Creek basins.

Sulfate and bicarbonate are the predominate anions of the surface waters of West Virginia. The range of bicarbonate concentration varies from 0 ppm to 200 ppm. Sodium concentration ranges from 0.4 to 142 ppm and potassium from 0.3 to 7.6 ppm. These concentrations are generally low throughout the state.

Water of less than 60 ppm hardness is commonly found in parts of the Potomac, Tygart Valley, Cheat, Little Kanawha, Gauley, and Elk River basins. Hard water, over 120 ppm hardness, is found in parts of the Potomac River basin.

There is a significant variation in the iron concentration of West Virginia streams. Iron concentrations are less than 0.30 in some parts of the state, but in portions of the Tug Fork, Twelvepole Creek, Greenbrier River, Wheeling Creek, Monongahela River and North Branch Potomac River basins the concentrations have been found in excess of 1.0 ppm.

Chloride content is generally less than 25 ppm in most surface waters. In some areas of the Kanawha River basin and in Fishing and Middle Island Creeks the chlorides have exceeded this value.

Flouride concentration ranges from 0.0 to 1.2 ppm and is generally less than 0.5. Nitrate concentrations are not significant in most areas of the state and range from 0.0 to 13 ppm.

The dissolved oxygen content of most streams in West Virginia is above 6.0 ppm most of the time, but in every major basin there are areas where the dissolved oxygen occasionally drops below this average.

The quality of water of most streams now is a reflector of the interplay between its natural and actual environment. Where the effects of man are minimal, the quality of water to a degree can be predicted

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on the basis of the geology and climate of the area. Generally, but not necessarily, the water is of a better quality in these areas than in areas where man has upset the hydrological forces.

The amount of ground water needed for domestic use is generally available throughout the state, however, larger supplies may not be available at a given locality. Water-rich alluvial deposits adjacent to the Ohio River yield enormous quantities of water, while alluvial deposits in other stream valleys are less yielding. Cavity-ridden limestone aquifers in eastern West Virginia provide supplies adequate for present industrial, municipal and irrigation needs. The area of flat-lying, coal-bearing sandstone and shale rocks that underlies the western two-thirds of the state provides water supplies for small municipalities and industries, but larger supplies may not be available and will require prospecting and major development.

All present uses of water will grow in the coming years. Industrial growth in the major river valleys may be reasonably expected to continue. Additional light industry throughout the state is being propounded as a partial solution to the state's economic problems. Some progress in this direction has been made and an increase in industrial water use is expected.

Use of water for hydropower in West Virginia will undoubtedly increase in the future. In general, the rivers draining the western slopes of the mountains in the eastern and southern parts of the state offer the best potential for future hydroelectric power developments. Rivers capable of producing large amounts of power at a reasonable cost are: New River, Greenbrier River, Gauley River, Elk River and Cheat River. Many of the existing and planned lakes have a potential for for the development of hydropower and undoubtedly will become important in supplying the increasing demand for hydroelectric power.

Domestic use of water and demand is expected to increase due to population trends. In the past decade the population has decreased, however, if economic and employment conditions continue to grow a gradual increase will be shown in the demand for usable water.

The complexity of the water resources management problem is enormous, due to the fact that all uses of water are interdependent of each other. With the growing demand for usable and available water the Department of Natural Resources, in coordination with the Department of Commerce, the designated state planning agency; is in the process of the development of a comprehensive water resources management plan that is geared to the needs of the people of West Virginia. This study proposes that water resources can be managed by a comprehensive approach within which political, social, economic, and physical aspects of the problem are considered.

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The future of West Virginia is closely tied to its abundance of

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Natural Resources. This is particularly true of its water resources. The full potential for development of West Virginia's water resources has not yet been reached; similarly, the full potential for a conflict over the uses of the water in the state has not arisen.

West Virginia, with its extensive areas of industrial development and its proximity to the increasing recreation population of the east coast is closely appraising and assessing its water resources, prior to the problems that will undoubtedly arise in the future.

In the development of a comprehensive plan for the state of West Virginia's water resources, the Elk River was selected as a pilot project to test the effectiveness of the approach. In selecting the basin to be studied different criteria was used in the selection, such as industry, recreation, population. The Elk River was also selected on its merits of having to some extent problems that are significant of other streams in the state.

The purpose of the demonstration project is to test, on a manageable scale, the approach to planning established by the state. Three aspects of the proposed planning approach can be singled out for separate evaluation: (1) The establishment, development, and operation of planning and policy organizations for the management of water resources, with the development and implementation of an orderly procedure for setting goals and satisfying them; (2) The development of an inventory data system that will be instrumental in evaluating alternatives; and (3) The development and testing of a method for deriving water resources objectives.

Pollution of streams is generally considered to be the main water problem in the State at the present time. The major contributors to the pollution of our streams are industrial and domestic wastes with the wastes from coal, gas and oil operations as well as those from chemical production being of significant stature. In recent years a substantial reduction in pollution has been evident due to the various federal, state and local agencies that have joined together in their efforts in abating pollution.

Over two million dollars in matching funds were spent in the construction of sewage treatment plants in West Virginia during the fiscal year 1966-67. Although this is a significant amount of money it will take approximately \$40 million to furnish adequate sewage treatment facilities for the communities in West Virginia within the next five years.

In order for the State to meet these requirements the following problems must be resolved:

1. A "constitutional block" that does not allow the state of West Virginia to participate in programs that involve certain matching provisions.

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- 2. A substantial increase in matching funds from the Federal Government will be needed if the five year deadline is to be met.
- 3. Coordination between the state and various federal agencies that are involved in loans and grants to communities.

The municipalities are not alone in facing the growing problem of pollution. Industry is growing both in volume and products and their wastes must be handled. Industries and state officials have been working together in resolving the various problems of reducing the pollution of our streams; however, the problem of financing is the major problem. This problem is not only a deterrent to cleaning up our streams but also a factor that has an economic impact upon future expansion of industry and also a factor that may be contingent upon new industrial development.

One of the most vexing problems that the state is facing is the problem of acid mine drainage. The acid mine drainage abatement program, especially drainage from abandoned mines, has been severely curtailed by the closing down of the Federal Water Pollution Control Administration Roaring Creek-Grassy Run Mine Sealing Demonstration Project. This project was the one bright spot in finding a solution to solving the problem that has been illusive for the last fifty years. Recent legislation by West Virginia has resulted in a strict control of surface mining practices in West Virginia. This action was taken to insure that the mining operations will not destroy the asthetics of nature or degrade the quality of West Virginia streams.

Competition between industries and municipalities for available water supplies has already begun in some localities, especially along the Ohio and Kanawha Rivers, but for the state as a whole this problem is not yet serious. Lack of a large, easily developed water resource retards the development of some areas. Irrigation use is small and has created no significant problems but the practice of supplemental irrigation may increase as the demand for agricultural products increases. Floods and low-flow augmentation is a problem on the smaller streams. Major structures on larger streams deter flooding and augment to some extent, but to cope with these problems on smaller streams is both difficult and expensive.

Legal problems resulting from increasing withdrawals of water in areas of limited supplies, and questions concerning the right to use water are just beginning to emerge. Little of the existing statutory or case law in West Virginia involves water rights, and virtually none of it gound water rights. Some consideration has been given to the adoption of a statutory system of water rights before major problems of this nature arise.

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REGION I

General. Region 1, composed of the three counties of Putnam, Kanawha, and Boone, is the most populous of the state's nine regions and the leader among regions in terms of total employment, value added by manufacturing, total personal income, and many other indices of economic activity and development. This lofty position is mainly due to the influence of Kanawha County in which is located the City of Charleston (State Capitol and the State's largest city) and also the surrounding cities of South Charleston (with its chemical complex); St. Albans; Dunbar, and Nitro. Together these five cities have a population in excess of 130,000.

Topographically, Region 1 is characterized by predominantly rugged terrain with areas of rolling land in the western portion and limited amount of level land bordering its major waterways and their tributaries. The Kanawha River, which enters the Region near Montgomery and flows north-westward through a highly industrialized and highly populated belt over 30 miles in length to Mason County and thence to the Ohio River, has unquestionably been the predominant influence on the development of the Region and its economy from the earliest days of population settlement. Table 1A provides additional information about the geography of the Region.

The quality of intra-regional and interregional transportion linkages in the region is rather uneven among the various modes. Inland water transportation, which has already briefly been touched upon, is excellent in the Region. The Kanawha River, which in Region 1 is navigable throughout its entire length, connects the major industrial complexes within the Region with one another and with markets and sources of raw materials outside the Region via the vast Ohio-Mississippi inland water transportation network. Water transportation offers an extremely economical method of transporting large quantities of industrial raw materials (coal, chemicals, petroleum, cement, sand and gravel, etc.) and has enabled industry, especially the chemical industry, to flourish in the Kanawha Valley and make of it one of the leading chemical centers of the nation and of the world.

Rail connections within the Region and between the Region and areas outside are also good. Both the New York Central and the combined Baltimore and Ohio-Cheasapeake and Ohio have major lines paralleling the Kanawha River and traversing the Region through Kanawha and Putname Counties. The Baltimore and Ohio has an additional important line which parallels the Elk River and approaches Charleston from the northeast, and large volumes of coal and chemicals are carried on this line. Numerous branch lines also exist in Boone County, in the southern part of the Region, and serve chiefly to transport the coal production of

this area to markets both within and outside Region 1.

With regard to highway facilities, however, Region 1 is less well served than similar areas of comparable economic importance in other sections of the nation. The topography and resultant high cost of road construction in the Region have been primarily responsible for this deficiency, and it is expected that with the completion of the Interstate and Appalachian highways allotted to the Region this comparative disadvantage will be largely eliminated. Interstate 79 and its continuation south of Charleston by Appalachian Highway G will give the Region greatly improved access to the northern portion of the state and the industrialized Region centering on Pittsburg and also to the natural resource wealth of Region 9. In a similar manner, Interstate Route 77 will greatly improve the time-distance ratio of northsouth motor travel and will connect Charleston with centers such as Cleveland and Akron in the north and the developing industrial and population centers of the Piedmont and the deep south. Finally, Interstate Route 64, which is nearing completion, will significantly improve the speed and ease of passenger and truck transport between the important centers of the Kanawha and Ohio River Valleys.

In air transportation, as in the field of highway construction, Region 1 has lagged somewhat behind other comparable regions of the nation. Partially to blame are the rugged terrain of the region and the high costs of runway construction. With the advent of jet airport (the only commercial and general aviation airport presently existing in the region) are rapidly becoming obsolete. The economic health of the entire region as well as that of neighboring regions demands reasoned analysis of the various alternatives and immediate concensus with regard to a plan for bringing this part of West Virginia into the jet age.

Population. Taken as a whole, Region 1 gained moderately in population during the decade 1950-60. Gains were unevenly distributed in the region, however, and Boone County actually lost population at the rate of 13.3%. Kanawha County gained population by 5.5% while Putnam County's population increased by 12.1%, a figure higher than that for the nation as a whole. Population estimates for the year 1966 indicate that the region has lost population (1.4%) since the last census. Over the same year period, it is estimated that the population of Kanawha County and Boone County has declined while Putnam County is estimated to have gained population, 10.6% over the six-year period. (Table 1B)

Kanawha County, ten times more populous than either of the other two counties comprising Region 1, is the only county in the region with a significant percentage of urban population. Boone County was recorded as having no urban population in 1960, while in Putnam County only 6.3% of the total county population could be considered as urban. Fully 9.7% of the population of Boone County is classifiable as rural non-farm, indicating the highly dispersed pattern of population distribution in that county. The corresponding figure in Putnam County is

81.3%. These figures point up some of the dissimilarities between Kanawha County on the one hand and Putnam and Boone Counties on the other hand and underline the difficulties of providing minimally acceptable levels of public services to citizens living in areas characterized by anachronistic patterns of population distribution.

Employment and Economic Activity. It is difficult to make generalizations regarding employment, unemployment, and other factors pertaining to the economic life of Region 1. In point of fact, Region 1 is a far from homogeneous entity, and to thoroughly understand the problems of the region, one must study and understand the problems of the region, one must study and understand the problems of the subregions (counties) which comprise it. This, in 1965, while manufacturing constituted the principal source of employment in both Kanawha County (23.9%) and Putnam County (44.4%) it was no where near as important a component of total employment in Boone County (5.5%). While employment in Boone County is heavily concentrated in coal mining (38.9%) mining constitutes a relatively small percentage of total employment in both Kanawha (3.7%) and Putnam (1.4%) Counties.

Taken as a whole, manufacturing constitutes the primary source of employment in Region 1 (24.1%), followed by wholesale and retail trade (18.6%) and government (13.8%). Over 95% of manufacturing employment is concentrated in Kanawha and Putnam Counties (88% in Kanawha County alone) and over 50% of this employment is concentrated in the chemical and allied products industry. Such nationally prominent firms as Dupont, Union Carbide, Monsanto, Goodrich-Gulf, FMC Corporation and others have substantial investments in plant and employment in the vast industrial complexes which dot the entire length of the Kanawha Valley in Region 1. Metal industries along with heavy and light manufacturing industries constitute the bulk of the remainder of manufacturing employment in the region.

1965 rates of employment and unemployment also vary widely among the counties comprising Region 1. Whereas the unemployment rate for the region was 6.5% (below the state level of 7.8%, but significantly above the national level of 4.6%), 14% of the labor force was unemployed in Boone County, while in Kanawha and Putnam Counties, the rates were 6.2% and 5.7%, respectively. (Tables 1C and 1D)

Agriculture as a source of employment is very insignificant in Region 1. Only in Putnam County, where agriculture stands second to manufacturing as a source of employment, is agriculture important as a generator of employment. Even in Putnam County agriculture runs a distant second to manufacturing (13.6% to 44.4%). In the region as a whole, agriculture employs only 1.5% of the labor force.

In keeping with the national trend, farming has been suffering a decline in importance in Region 1. The number of farms decreased

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58.6% in the period 1954-64 (from 3,882 to 1,862). The land devoted to farming has also decreased substantially, from 271,280 acres to 160,277 acres, (45.3%). Most of this loss occurred between 1954-59 when farm acreage diminished 33.4%. The value of farm products suffered a 30.9% reduction between 1954-64. The only exception to this trend occurred in Kanawha County where there was a 2% increase in the number of farms and an 8.6% increase in farm acreage between 1959-64.

Income. Only Kanawha County approaches the national level of income while Putnam and especially Boone fell far below. Kanawha County, with a per capita disposable income of \$2,334, was almost equal to the national level (\$2,367) in 1966. The level of per capita disposable income in Putnam County was \$1,655 while in Boone County it was only \$1,373, nearly \$1,000 below the national level. The median family income in Kanawha County in 1966 was \$6,403 (higher than 94% of all U.S. counties) while Putnam and Boone Counties lagged far behind, \$5,366 and \$4,879, respectively.

Problems and Potential. Region 1, while ranking as one of the wealthiest and most industrialized in West Virginia, is indeed a region of paradox. Within only a few miles of the urban heart of the region where some of the highest industrial wages in the country are paid, poverty and its counterpart, lack of opportunity, are commonplace.

From the regional overview map at the end of this chapter, the concentration of the region's growth resources in the Kanawha Valley Supplemental Investment Area is evident. The future importance of this SIA is illustrated by the merging of the highway systems at its hub and the clustering of potential industrial sites in the River Valley.

One of the major constraints on the future development of the Kanawha Valley SIA is the relatively poor quality of the water supply for industrial usage. This constraint is particularly serious in the downstream portions of the SIA where the best industrial sites exist. Within the region, efforts must be made to correct both industrial and residential pollution problems as well as to encourage development of reservoirs to augment the existing water supply. While the region must rely on upstream sources for much of its future water needs, major portions of both the Elk River and Coal River lie within the region and consideration should be given to utilizing them for future water needs.

In the area of education, the Kanawha Valley SIA is fairly well endowed. However, efforts must be made to strengthen the vocational education efforts, particularly in the outlying areas of the region. Increased attention should be paid to vocational education in Putnam County portion of the SIA and in the developmental investment area of Madison.

Additional efforts such as the recently initiated Kanawha County School Districts reading clinic should be undertaken to insure

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that the children of the region are not disadvantaged in such basic opportunities. The introduction of educational television to the region in the near future will be of importance to the region's basic education program and all efforts should be made to assure its success.

Higher education in the SIA is generally adequate but additional facilities are needed to insure the growth of the higher education program. This situation is particularly accute in the case of the Kanawha Valley Graduate Center.

Region 1, while having a significant number of health facilities provides portions of several neighboring regions with this service. One drawback to the level of hospital services in the region is the large number of very small hospitals with their expected loss of economics because of rising operating cost. The improved highway system will upgrade significantly the access to the health facilities of the SIA, thus ruling out the need to develop a system of local hospitals.

The living environment of the entire region must be steadily improved if the region is to continue to compete with the rest of the nation. Efforts must be made to improve the quality of housing throughout the region and to provide the essential water and sewage services to the residents. The serious problems of air and water pollution in the SIA must be attached and overcome. Improved recreational and cultural facilities would greatly enhance the region and complement its growth potential.

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REGION 1

ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Keyed to Overlay on Page)

APPROVED ARC INVESTMENTS

No.	Location	Description	Section	A	RC Funds
1	Montgomery	W. Va. Institute of Technology Engineering Classroom Building	214	\$	153,630
2	Charleston	Morris Harvey College - Physical Education Building	214		159,000
3	Charleston	Kanawha County Public Library	214		249,460

PENDING ARC INVESTMENTS

None

APPROVED EDA INVESTMENTS

No.	Location	Description	EDA Funds
1	Charleston	Charleston Civic Center	\$ 935,000
2	Belle	W. Va. Terminals, Inc Truck Terminal	1,130,000

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Table 1-A Geography

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1.6	49.7	3.0	54.3	314.2
2.6	10.9	34.4	13.2	34.3
13.0	0.66	119.9	231.9	8,248.2
2.1	3.8	1.5	7.3	100.0
195	806	349	1,758	24,079
Suone	Kanawha	Putnam	Totals for Region	State
	561 2.1 13.0 2.6	908 3.8 99.0 10.9 49.7 5.5	501 2.1 13.0 2.6 1.6 .3 908 3.8 99.0 10.9 49.7 5.5 349 1.5 119.9 34.4 3.0 .9	908 3.8 99.0 10.9 49.7 5.5 11.758 7.3 231.9 13.2 54.3 3.1

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Sources: U. S. Cenque of Population 1960; U. S. Cenaus of Agriculture 1964; West Virginia Department of Commerce, Planning and Research Division, "West Virginia Incorporated and Unincorporated Communities."

Table I-B Population

Counties	Population 1960	Population 1950	% Change 1950-60	Pop. Sq. Mt.	Urban Pop.	Rural Farm Pop. as % of Total	Rural Non-Farm Pop. as % of Total
Boome	28,764	33, 173	-13.3	. 57	:	3.0	97.0
Kanawha	252,925	252,925 . 239,629	5.5	279	8.99	60	32. 4
Purnam	23, 561	21,021	12.1	89	6.3	12.4	81.3
Totals for Region	305, 250	293, 823	+ 3.9	173.6	55.8	1.9	42.3
Mate	1. 860, 421	2,005,552	- 7.2	7.1	18.2	6.5	55.3
Netia	,		+11.7	\$0.5	6.69	7.5	22.6

Sources: U. S. Censes of Population, 1960

Table 1-C Labor Force 1965

County	Labor Force	Employment	%	% Unemployment	%
Boone	4,996	4,298	0.98	869	14.0
Kanawha	94,000	88,200	93.8	5,800	6.2
Putnam	5,300	5,000	94.3	300	5.7
Region	104,296	861,76	93.5	861,9	6.5
State	612,000	563,400	92.2	47,600	7.8
Nation	78,357,000	72,179,000	95.4	95.4 3,456,000	4.6

Sources: West Virginia Department of Employment Security; Statistical Abstract of the U. S., 1966

Table 1-D Employment 1965

							Transp. & Wholesale &	Wholesal	e &					
ty	County Agriculture	lture	Mining	Manufact. Construct.	Constr	uct.	Commun.	Retail T	rade	Retail Trade Finance	Services	Services Government Others Total	Others	Total
Boone	92	1.8%	76 1.8% 1661 38.9%	233 5.5%	98	2.0%	262 6.1%	573	13.4%	86 2.0%	287 6.7%	233 5.5% 86 2.0% 262 6.1% 573 13.4% 86 2.0% 287 6.7% 556 13.0% 478 10.6% 4,298	478 10.6%	4,298
Kanawha	700	ω.	3300 3.7	21050 23.9	3350	3.8	8450 9.6	17100	19.4	3300 3.7	10000 11.3	21050 23.9 3350 3.8 8450 9.6 17100 19.4 3300 3.7 10000 11.3 12350 14.0 8600 9.8 88,200	8.6 0098	88,200
Putnam	680 13.6	13.6	70 1.4	2220 44.4	180	3.6	170 3.4	480	9.6	50 1.0	120 2.4	2220 44.4 180 3.6 170 3.4 480 9.6 50 1.0 120 2.4 560 11.2 470 9.4 5,000	470 9.4	5,000
Region		1.5	1,456 1.5 5,031 5.2	23,503 24.1	3,616	3.7	8,882 9.1	18,153	18.6	3436 3.5	10407 10.7	223,503 24.1 3,616 3.7 8,882 9.1 18,153 18.6 3436 3.5 10407 10.7 13466 13.8 9548 9.8 97,498	9548 9.8	97,498
State	31300	5.6	31300 5.6 47800 8.5	128600 22.8	22000	3.9	40600 7.2	83400	14.8	13800 2.4	55600 9.9	128600 22.8 22000 3.0 40600 7.2 83400 14.8 13800 2.4 55600 9.9 81500 14.5 58800 10.4 563,400	58800 10.4	563,400

Source: West Virginia Department of Employment Security

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Region 1

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Flants	No. of Large Plants	Total No. of Plants	Total Employment
Heavy Manufacturing	49	1	1	51	2,993
Light Manufacturing	56	3	-	59	1,953
Metals	23	4	-	27	1,324
Wood & Paper	16	-	-	16	248
Chemical	12	1	7	20	11,434
Petroleum	4	2	-	6	577
Glass & Pottery	8	-	1	9	952
TOTAL	168	11	9	188	19,481

Because symbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

RECREATION

Recreation Resources: The primary recreation resource is the Kanawha River for power boat and water sking activities. Segments of the Elk, Coal and Pocatalico rivers provide fishing and small craft floating and canoeing. Kunting is primarily small game with some deer. Fishing is for base, catfish, pike and muskie. Archeological and historical sites exist as natural cultural resources.

Regional Recreation Areas: Kanawha State Forest offers swimning, picnicking, camping, horseback riding, hiking and hunting. Fork Creek hunting area provides small game and deer hunting. Private and public organizations have created cultural centers and provide music, dance, dramatics and art programs. Power boat launch sites, both public and private on Kanawha River. A Zoological Park operates at Teays Valley. Employee Association Parks, golf courses and camps complete the region's recreation assets.

Local Recreation Areas: Playgrounds 13: playfields 14; county or city parks 14; county camps 1: swimming pools 3. Coonskin, Shawnee and Little Creek Parks and roadside parks provide additional facilities.

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SOCIAL OVERHEAD CAPITAL

Libraries

Region 1 is served by: one major library in Charleston and four smaller libraries in Kanawha County, a book express in Boone County, and a regional library in Putnam County.

Hospitals

Region 1 is served by fifteen hospitals with a total bed capacity of 1,568.

Research Facilities

The three research facilities in this region are: Union Carbide Technical Center, Monsanto, E. I. Dupont-Belle Works.

Colleges

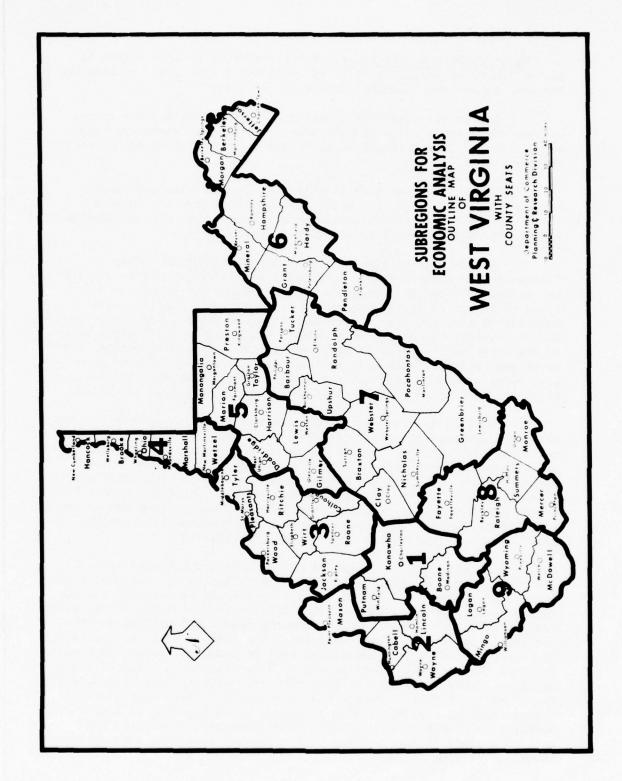
College	Enrollment
W. Va. State College	3,146
Morris Harvey College	2,874
Kanawha Valley Center (WVU)	73

Vocational Technical Schools

The major vocational training schools in Region 1 are located in Karawha County. Boone and Putnam counties have small vocational training programs.

INDUSTRIAL SITES

1.	Buffalo Site	700	Acres
2.	Rumer Kite	119	Acres
	Frazier Bottom Site	1,900	Acres
4.	Eleanor Site	565	Acres
5.	Red House Site	41	Acres
6.	Red House Site	90	Acres
7.	Bancrof: Site	92	Acres
8.	Walnut Grove Site	440	Acres
9.	Hometown Site	1,054	Acres
10.	Bear Creek Site	281	Acres
11.		32	Acres
	Clark Field	1,754	Acres
13.	Poca	62	Acres
	United Fuel Gas Site	168	Acres
15.	Nitro	152	Acres
	Culloden Site	493	Acres
	St. Albans Site	32	Acres
	St. Albans Site	274	Acres
	Elk Hills Site	49	Acres
20.	Dickinson Site	250	Acres
21.	DuPont City Site	48	Acre:
22.	Bedford Land Site	43	Acres
23.	Coalburg Site	30	Acres
24.		38	Acres
25.	Hugheston Site	34	Acres
26.	Madison Site	147	Acres



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Water Resources Activities. Water resources in this region is one of the major contributors to the economic growth that has made the Kanawha Valley the "Chemical Center of the World."

Due to its strategic location the Kanawha Valley has access to many world trade markets, easy access to the vast amount of natural resources, and is relatively close to the large metropolitan cities of the east coast.

Water resources work in this area is more oriented toward water pollution control than water resources development. However, these two different aspects are interrelated and both plan an important role in the further development of this important area.

At the present time, there is a phased program set up to "clean-up" the Kanawha River. The three-phased program is in the latter stages of Phase II. Progress in the program can be measured in terms of wastes no longer discharged to the river. This includes hundreds of tons per year of fly ash and other solids. It can be seen in the recreational aspect of fishing. Ten years ago certain stretches of the river were so grossly polluted with wastes from industrial concerns and municipalities that it could not support any type of game fish being caught in front of the State Capitol, however, this accomplishment does not mean that the total river is free from pollutants.

Located in the major population concentration area on the Kanawha River are nine municipalities with a population over 120,000. These municipalities all have to some degree waste treatment plants, but several of these plants are not efficient enough to meet water quality standards that have been set by the state. Due to certain problems of financing that face the municipalities and state there has been a "lag" in the construction of secondary facilities. However 1968 should see a significant increase in municipal facilities construction involved in plant expansion and secondary treatment installation.

As of July, 1967, some 43 million dollars had been spent by industry and the municipalities in the installation of treatment facilities. Of this amount, 17 million has been spent by industry and the remaining 26 million by the municipalities. The total yearly operating costs amount to 7.6 million with industry spending 5 million and the municipalities spending the remaining 2.6 million. With the facilities now being installed, the additional cost to industry amounts to 4 million and the municipal costs amount to 35 million or a total of 1.5 million dollars above current expenditures. With the completion of these new facilities, industry will have spent 21 million dollars on construction of facilities with an annual operating cost of approximately 6 million dollars. The municipalities will have spent 29.5 million dollars on construction with an annual operating cost of approximately 4 million dollars.

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The small watershed planning and development program carried on by the USDA, SCS, in the region is at various stages. The Elk Two Mile Creek work plan is completed and is awaiting further review in Washington. The Kanawha Two Mile Creek plan is completed and is undergoing formal review. The Rocky Fork study was completed. The findings were favorable and local interest in the project was very good, this project was primarily for channel improvement. The Blakes Creek-Armour Creek study is completed. However, along with the other projects in Kanawha County the proposed bond issue for the construction of the various structures and developments was defeated. Although the issue was rejected by referendum, the projects will eventually be constructed, but at a decelerated pace.

Other developments in the region include a regularly scheduled inspection of some 20 coal preparation plants. Most of these preparation plants are located along Coal River which enters the Kanawha River at St. Albans. This program has been quite successful. Streams that were once grossly polluted with solid wastes are now clear. This success can be attributed to the cooperation and efforts of both the state and the coal companies.

The Elk River basin also lies partly in this region. The confluence of the Elk and the Kanawha is at Charleston. Although the Elk River in this area is subject to wastes from industrial concerns and municipalities the state is in the process of correcting these problems. However, a program approach has not been decided at this time, in that this stretch of the Elk River will be included in the pilot plan for the comprehensive water and related land resources plan for the state.

The Kanawha River, especially from the Charleston Area upstream, is quite heavily used for recreation as far as boating and water skiing are concerned. Fishing is also becoming more popular since the proximity of the river to the Charleston Area is ideal. The Elk River is considered one of the best sport streams in the State in terms of fishing and camping. The lower stretch in Charleston is used for boating and river traffic in the backwater area. Coal River is one of the State's sport streams that was lost to pollution from coal preparation plants; however, it is once again being used for fishing and camping upstream and boating in the lower reach. The Pocatalico River, which has recently been exposed to tremendous salt discharges from oil well operations, is currently under close surveillance. In the pollution abatement effort some 300 salt water ponds were taken out of service and reclaimed and some 30 deep well disposal facilities were installed.

In the attached bar graphs the inadequate industrial waste treatment plants are reflected by the agency criteria of considering the major chemical installations inadequate due to low water quality during low flow periods. The municipal program very definitely shows the need for treatment facilities in Boone and Putnam Counties with Kanawha County showing roughly 60% of its population served with treatment. (This includes both the sewered and unsewered population.)

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RECREATION

ZOO





CABINS



ORGANIZED CAMPING



TENT CAMPING



PRIMITIVE CAMPING



TRAILER CAMPING



HUNTING



BEAR HUNTING



DEER HUNTING



SCENIC AREA



ARCHEOLOGICAL SITE



HISTORICAL SITE



ART GALLERY



CONCERT MUSIC

CULTURAL DANCING





AUTO RACING





HORSEBACK RIDING



PICKNICKING



PUBLIC GOLF COURSE



HIKING



SNOW SKIING



WATER SKIING



SWIMMING



FISHING-CANOEING

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POWER BOATING



INDUSTRIAL SITES POTENTIAL INDUSTRIAL SITES

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UNITED STATES HIGHWAY

-STATE HIGHWAY

++++++++ RAILROAD

POPULATION CONCENTRATION

INTERSTATE HIGHWAY - COMPLETED

INTERSTATE HIGHWAY - PLANNED OR

UNDER CONSTRUCTION APPALACHIAN DEVELOPMENT HIGHW

COMPLETED

APPALACHIAN DEVELOPMENT HIGHWA PLANNED OR UNDER CONSTRUCTION HIGHLAND SCENIC HIGHWAY-PLANNED

UNDER CONSTRUCTION



COMMERCIAL AIRPORTS

GENERAL AVIATION AIRPORT-OPEN SYM INDICATES A PROPOSED AIRPORT

INDUSTRIAL FACILITIES

See last page of text for explanation o industry type and symbols.



HEAVY INDUSTRY



LIGHT INDUSTRY



METALS



WOOD & PAPER PRODUCTS



CHEMICAL PRODUCTS



PETROLEUM PRODUCTS



GLASS & POTTERY PRODUCTS



MINING

SOCIAL OVERHEAD

See last page of text for explanation symbols.



LIBRARY



HOSPITAL



RESEARCH FACILITY



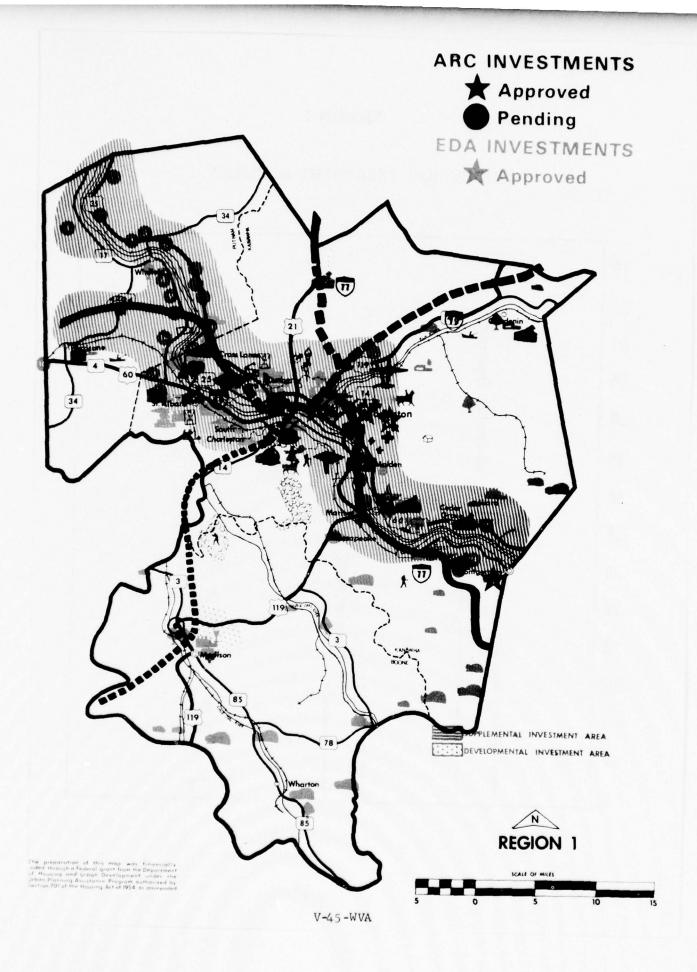
UNIVERSITY

COLLEGE



BRANCH COLLEGE

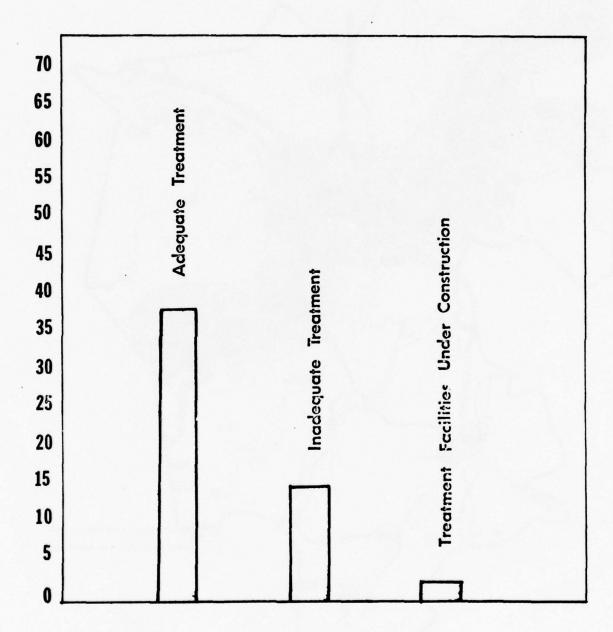
VOCATIONAL TECHNICAL SCHOOL



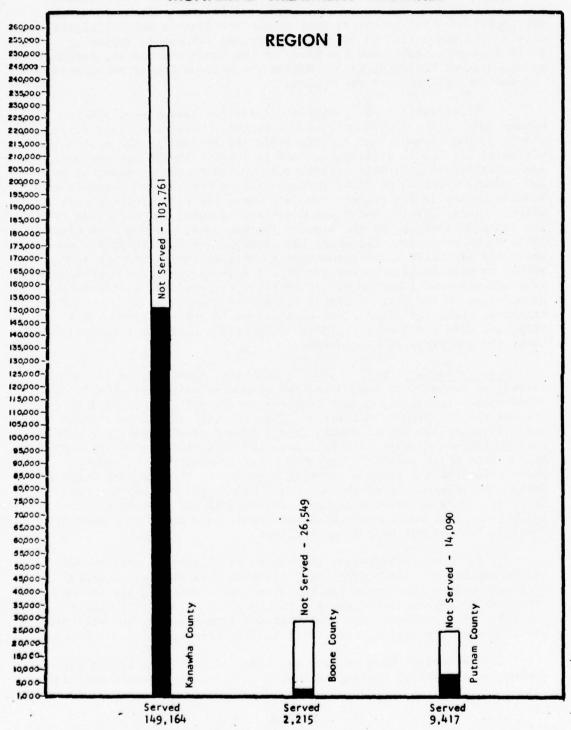
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REGION 1

INDUSTRIAL TREATMENT FACILITIES



MUNICIPAL TREATMENT FACILITIES



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REGION II

General. Region II (see regional map for location) is composed of the counties of Mason, Cabell, Wayne and Lincoln. It is served by the important urban center of Huntington (the State's second largest city - 1960 population 83,627) and by several subcenters including Point Pleasant, Mason, and New Haven in the north and Kenova, Barbours-ville, Milton, Winfield, Wayne, Hamlin and West Hamlin in the central and southern portions of the region.

Topographical and geographical factors have played a determining role in the development of the region. Three important rivers, the Ohio, the Kanawha, and the Big Sandy are located in the region and virtually all level, developable land is located in the valleys bordering these rivers and their tributaries. Mason County is bisected by t the Kanawha River which flows through it from its eastern boundary with Kanawha County to its western boundary where the river joins the Ohio River. Mason, Cabell, and Wayne Counties, in turn, are separated from the State of Kentucky on the west by the Big Sandy and Tug Fork Rivers. Three of these rivers, the Ohio, the Kanawha, and the Big Sandy, are navigable and their inter-connection as well as their location have served to make Huntington the hub of a tri-state region of considerable size and economic importance. In addition to providing a wide range of services to the rest of Region II, Huntington serves as a center of industry, trade and finance for a wide area including parts of West Virginia, Ohio and Kentucky. Table 2A provides additional information about the geography of the region.

Transportation. With regard to transportation, Region II is well served, as has already been noted, by navigable waterways of major importance. In addition, most sections of the region benefit from excellent rail transport facilities. The main line of the Chesapeake and Ohio traverses Cabell County, and a branch of the same line extends through Lincoln County. The Baltimore and Ohio operates an important branch line which parallels the Ohio River from Huntington through Mason County to the State's northern panhandle. The New York Central follows the Kanawha River through Mason County and crosses the Ohio River into Ohio at Point Pleasant. The Norfolk and Western Railroad follows the western boundary of Wayne County to a point near Huntington where it crosses the Ohio River into Ohio.

In terms of highways, the region is relatively well served. Interstate Rt. 64, connecting the Huntington area to the industrial area surrounding Charleston has recently been completed, and the construction of Appalachian Highway G in Lincoln County will extend Interstate Rt. 79 from Charleston southwestward into Kentucky and will have the effect of the region, especially in less developed Lincoln County.

Presently, there is only one commercial airport in the region (Tri-State Airport at Huntington, which is served by three commercial ${\bf r}$

airlines); one general aviation airport at Point Pleasant; and one private airport near Hamilin in Lincoln County. The new jet airport proposed by the FAA for a site in Putnam County (Region 1) approximately 35 miles east of Huntington would provide a significant improvement in air transportation services and facilities in the entire region.

Population. Cabell, Mason, and Wayne Counties increased modestly in population between 1950 and 1960, but their population increases were more than compensated for by a decrease in population in Lincoln County, and, as a result, the region as a whole showed a net population loss amounting to a percentage decrease of one half of one percent. Cabell County, with over 50% of the region's population, is the most highly urbanized of the four counties comprising the region, and almost 74% of its population is located in urban areas. The other three counties fall below the state average in this respect, and Lincoln County has virtually no urban population whatsoever. Over 83% of its population is classified as rural non-farm while 17% is classified as rural farm. The pattern of population distribution in Lincoln County is, therefore, of such a widely scattered and decentralized nature that the provision of basic public services such as education, health, cultural facilities, sanitation, etc. is rendered highly inefficient and uneconomic. If Cabell County is excluded from consideration (it exceeds the national average in the percentage of its population which is urban) the remainder Region II falls short of the national average of urban population and greatly exceeds the national average in the percentage of population which is considered rural non-farm. (Table 2B) It is estimated that the counties of Cabell and Lincoln have experienced slight population declines since 1960 while Wayne and Mason have had modest gains.

Employment and Economic Activity. Figures available for the year 1965 indicate that employment in Region II is concentrated in manufacturing (27.1% vs. 14.5% in the State). The rate of unemployment in the region was slightly less in 1965 than that for the State as a whole (7.7% compared to 7.8%) but was, nevertheless, substantially greater than the average for the nation. Unemployment was rather unevenly distributed throughout the region in 1965, however, and varied from 6.6% in Cabell and Wayne Counties to 13% in Lincoln County and 13.2% in Mason County. In Lincoln County the agricultural, mining, and construction industries have witnessed a steady decline in employment in recent years, while in Mason County it is the decline in employment in agriculture, construction, and transportation industries which has contributed to the continued maintenance of high level unemployment. (Tables 2C and 2D)

Agriculture as a source of employment and as a basic economic activity has been declining nationally, in the State, and throughout Region II over a period of many years. In Region II, only Lincoln and Mason Counties have significant employment in agriculture (25% and 18% respectively) and in both counties both the number of farms in operation

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and total agricultural employment have been declining steadily in recent years. In the region as a whole and in every county which comprises it, the farm operator family level-of-living index / is substantially lower than that for the nation as a whole. With the year 1959 serving as the base year (100=1959 national index) Lincoln County has an index of 60, and Cabell County an index of 70. To express these figures in another manner, the farm families in Lincoln County had a lower level-of-living than farm families in 82% of the counties in the U.S.; Wayne County farm families had a lower level-of-living than farm families in 81% of the counties in the U.S.; and, finally, farm families in Cabell County had a lower level-of-living than similar families in 70% of the counties of the U.S. The principal agricultural products of the region consist of dairy products, livestock products, and poultry and poultry products.

As already noted, manufacturing is the principle source of employment in Region II. In 1965, it constituted more than 27% of total employment in the region. Manufacturing employment has remained fairly stable in the region and has actually been increasing in some counties. The most important industries from the point of view of employment are the stone, clay and glass industries, the primary metals industry, and the metals processing industry. Also important are chemical and allied industries, transportation equipment industries, lumber and wood products industries, and clothing apparel industries. Value added by manufacturing in the region totalled \$136 million in 1963, an increase of 38% over 1958.

A glance at the regional map indicates the concentration of manufacturing activity in a few important centers in the region. The majority of Cabell County's industrial installations are located in the Huntington area and part of this same concentration spills over into Wayne County whose industrial installations are concentrated in the West Huntington, Ceredo, Kenova, and Neal Areas. Mason County is somewhat less heavily industrialized, and most of its industrial installations are of comparatively recent origin. Industrial development is relatively little advanced in Lincoln County although the situation shows signs of improving as a result of recent additions and expansions of local industrial capacity.

From the point of view of employment, mining is of secondary importance in Region II, and, as a result of technological innovations (automation), is tending to become increasingly less important. Coal is the principal mineral resource produced in the region and it is produced in every county. In 1965, Cabell County led in mining employment, followed by Lincoln, Mason and Wayne Counties in that order. Lincoln County, however, had the greatest percentage of its total employment

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^{1/} A general index based on average value of land and buildings, average value of agricultural products sold, proportion of farms with automobile, home freezers, and telephones.

concentrated in its mining industry. Crude petroleum and natural gas are also produced in the region, but neither are of great importance either from the point of view of employment or value of production.

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Income. Available data relating to family income and per capita disposable income indicates a wide diversity among the counties comprising Region II. As would be expected, it is the more industrialized counties of Cabell, Wayne, and Mason that show the highest income levels and the less industrialized county of Lincoln, which shows the lowest level. No county in the region, however, measures up to the 1966 estimate of median family income for the U.S. as a whole, and only Cabell County approximates the estimated 1966 national per capita disposable income. In terms of both median family income and per capita disposable income, Lincoln County was nearly 50% below national levels in 1966.

Problems and Potential. Region II is one of the State's most highly developed and prosperous regions; but it is not without its problems. Certain areas of the region, especially large portions of Lincoln and Wayne Counties have failed to share in the overall development of the region. In these areas, as well as in some areas of the more developed counties of the region, employment in traditionally important industries has declined, largely as a result of technological innovations which have resulted in the substitution of capital for labor. Farming, which used to provide a livelihood, however inadequate, to a large number of residents of the region, is becoming increasingly marginal and in many areas individuals have abandoned agriculture entirely thereby further swelling the ranks of the unemployed and lengthening the lists of welfare recipients.

The concentration of Region II's growth resources in the Huntington and the Point Pleasant-Mason Supplemental Investment Areas is evident from the regional overview map at the end of this chapter. Both these areas have significant growth potential with excellent transportation facilities, ample developable industrial sites and an adequate future supply of water for industry.

The Milton Developmental Investment Area currently has excellent transportation facilities as well as ample developable transportation facilities as well as ample developable land for industrial and other purposes. The Hamlin-West Hamlin DIA, on the other hand, is faced with just the opposite situation and its development efforts must focus on its potential as a service center to the Lincoln County hinterland. There is a pressing need for a variety of social overhead capital investments such as improved educational facilities in this part of the region, and the Hamlin-West Hamlin DIA is the logical service center.

The Huntington SIA is well endowed with the many necessities for future growth. Marshall University provides the area with excellent

higher education resource and the key to future development may be in an improved vocational education program which can reach out into the hinterlands of the regions to insure growth in the labor force.

The Point Pleasant - Mason SIA, while also needing to strengthen its vocational education program, may find it desirable to develop a higher education program at a future date. As this area grows the need will most likely develop for an improved hospital.

The proposed midway jetport could be one of the most important development factors to confront the region in many years. The advantages of the proposed facility to Region II are distinct and though the cost may be high, the anticipated advantages to the region appear to warrant the acceleration of this project.

The real test of the growth potential of the region, however, seems to rest in the regions ability to draw the population from the hinterlands and thus strengthen its labor force. However, in doing so it will be necessary to also provide them with improved housing and an improved living environment if they are to become full participants in the region's prosperity.

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REGION II

ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Keyed to Overlay Opposite Page)

APPROVED ARC INVESTMENTS

No.	Location	Description	Section	ARC Funds
1	Lakin	Lakin State Hospital Sewage Treatment	212	\$ 24,000
2	Huntington	Marshall University Library	214	80,745
3	Huntington	Marshall University Ed. T.V.	214	308,676
4	Pt. Pleasant	Pleasant Valley Hospital	214	344,355
5	Barboursville	Barboursville State Hospital	214	38,199
6	Lesage	Green Acres Mental Retard. Ctr.	214	37,804
7	Huntington	Cabell County Mental Retard. Ctr	. 214	117,362
8	Lakin	Lakin State Hospital Sewage Treatment	214	40,000
9	Pt. Pleasant	Mason County Airport	214	59,845
	Pt. Pleasant	Mason County Airport-Overrun	214	19,235
10	Huntington	Tri-State Airport	214	74,568
11	Barboursville	Barboursville Area Library	214	29,061

PENDING ARC INVESTMENTS

None

		APPROVED EDA INVESTMENTS	
1	Culloden	Culloden Sewage Treatment Fac.	621,000
2	Pt. Pleasant	Mason County General Hospital	372,000
3	Leon	Leon Water System	168,000
4	Hamlin	Hamlin Sewage Facilities	520,800
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Table 2-C Labor Force 1965

County	Labor Force	Employment *		.nempioyment	-
Cabell	39,856	37, 232	93.4	2,624	-
1.incola	3, 230	2, 810	87.0	420	13.0
Mason	6,840	5, 940	86.8	006	13.2
Wayne	10,716	466.6	93.3	777	-
Region	60,642	\$5,976	92.3	4,666	1
State	612,000	\$63,400	92.2	47,600	
Nation	78, 357, 000	72,179,000 95.4 3,456,000	95.4	3,456,000	

Sources. West Virginia Department of Employment Security: Statistical Abstract of the U. S., 1966

Table 2-D Employment 1965

									Transp	. e	Wholesa	1e &		Transp. & Wholesale &	240.00	too		Total
County	Agricultur	1ture	Mining	ng u	Manufa	Manufact. Construct.	Constr	ict.	Contract	in.	Retail	Trade	Finance	Services	200	1)	
			3.5	,	1000	20 90	1484	4 00,	3307	8.9%	0689	18.6%	1187 3.2%	3625 9.8%	4240	11.4%	1337 8 9 1 187 3 2 8 3 4 240 11 4% 4 10 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	37,232
Cabell	1230	3.3%	300	1.00	1000	47:4/0	-	1	1	1	-	1						
			, ,	, ,	950	7	130	4.5	230	8.0	240	8.3	250 8.7 130 4.5 230 8.0 240 8.3 80 2.8	N.A.	530	18.4	N.A. 530 18.4 375 15.3 2,815	2,815
Lincoln		1.10 23.1	04.7	200	2	-	1	1	1	1	-			_				
			000		0011	. 0 01	330	9 9	009	10.1	670	11.3	PO 1.3	260 4.4	016	15.3	200 10 0 10 0 10 0 10 1 0 0 10 1 0 0 10 1	5,945
Mason	1070	1070 18.0	200	3.3	1100	1		1	1		-	-						
					9100	0 00	300	1.0	889	6.8	1852	18.6	319 3.2	975 9.8	1140	11.4	2018 21 2 10 10 10 889 8.9 1852 18.6 317 3.2 975 9.8 1140 11.4 1074 10.6 9,994	6,994
Kayne	331	3.3	16	2	67.10	1	1		1						-	1		
						1			2003	0	6590	17.9	1666 3.0	4860 8.7	6820	12.2	17.9 1666 3.0 4860 8.7 6820 12.2 6249 11.0 55,936	55,986
Region	3371	0.9	897	1.6	15202	7.17	2343	1:	0700	1	1000							
	21300	4	47800	5	128600	22.8	22000	6.6	40600	7.2	83400	14.8	13800 2.4	85600 9.9	11300	14.5	C K 47800 8.5 12860 22.8 2200 8.9 40600 7.2 83400 14.8 13800 3.4 \$5600 9.9 41500 14.5 \$5850 10.4 \$53.400	\$53,400
State	31300	3.5	-		1	1												

Source: West Virginia Department of Employment Security

Region 2

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Plants	No. of Large Plants	No. of	Total Employment
Heavy Manufacturing	41	4	2	47	3,902
Light Manufacturing	41	9	1	51	3,039
Metals	16	4	2	22	4,965
Wood & Paper	21	3	-	24	683
Chemical	7	2	1	10	1,144
Petroleum	4	-	-	4	55
Glass & Pottery	19	4	1	24	2,495
TOTAL	149	26	7	182	16,283

Because symbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

SOCIAL OVERHEAD CAPITAL

Libraries

Region 2 is served by: two libraries in Mason County, the book express in Lincoln County, e regional library in Huntington serves Cabell and Wayne Counties.

Hospitals

Region 2 is served by six hospitals with a total bed capacity of 1,071.

Research Facilities

The four research facilities in this region are: Apple Grove Test Laboratory, Marshall University, International Nickel, Holland-Suco.

Colleges

College Enrollment
Marshall University 7,623

Vocational Technical Schools

The major vocational training schools are located in Cabell County. Lincoln, Mason and Wayne Counties have small vocational training programs.

RECREATION

Recreation Resources: Oriented to expansive water in the Ohio and part of the Kanawha rivers for power boating, water skiing and fishing. Guyandot and Twelve Pole Creek waterways hold potential for small craft floating, fishing and canoeing. Hunting is primarily for small game. The major recreation area development potentials exist at East Lynn and Beech Fork Reservoir sites.

Regional Recreation Areas: State Parks - Point Pleasant and potentially Beech Fork. State Forest - Cabwaylingo offers cabins, hunting, swimming, hiking and camping. State hunting and fishing areas - Chief Cornstalk and McClintic Wildlife Research station.

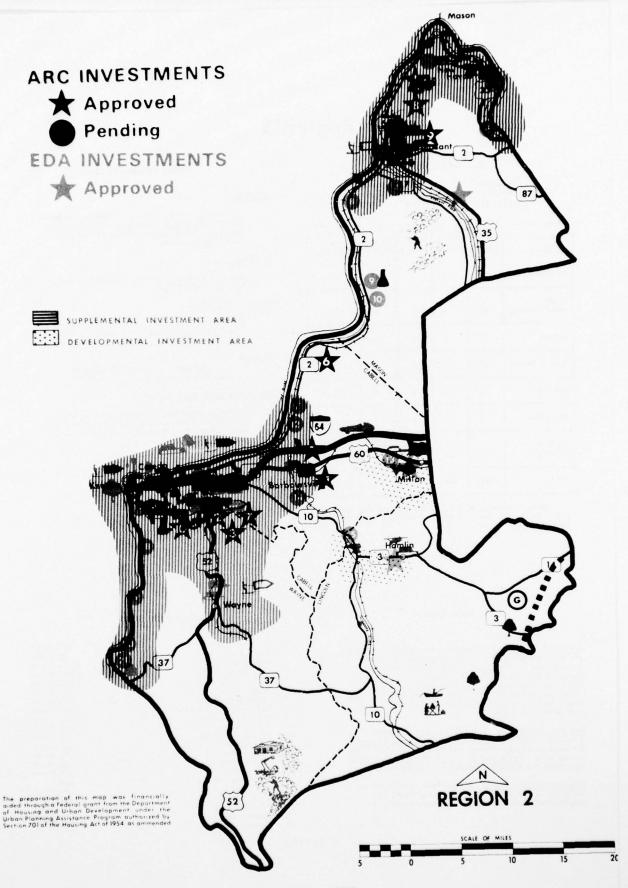
Local Recreation Areas: Ritter Park, a natural day use park; other public parks 7; playgrounds 22; playfields 19; county camps 1; swimming pools 4.

THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.

INDUSTRIAL SITES

1.	Clifton Site	257 Ac	rec
2.	Lakin Site	90 Ac	
	Graham Station Site	2,674 Ac	
	Pt. Pleasant Site	3,056 Ac	
	C. C. Lewis	1,210 Ac	
	Letart Site	622 Ac	
7.	Henderson Site	617 Ac	res
8.	Gallipolis Ferry Site	2,239 Ac	res
9.	Apple Grove Site	2,835 Ac	res
10.	Ashton Site	765 Ac	res
11.	Greenbottom Site	750 Ac	res
12.	Kyle Field Site	130 Ac	res
13.		30 Ac	res
14.	Martha Site	170 Ac	res
15.	Salt Rock Site	113 Ac	re-
16.	Twelve Pole Site	-458 Ac	
17.	Neal Site	100 Ac	1.
18.	Cyrus Site	445 Ac	res
	Prichard Site	841 Ac	res
	Hewlett Site	567 Ac	
21.		146 Ac	

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Water Resources Activities. Water resources in this region is of major importance to the economic growth due to its strategic location to the Ohio, Kanawha, Big Sandy, Tug Fork, and Guyandotte Rivers. This region is served by the important urban center of Huntington and by several subcenters including Pt. Pleasant, Mason and New Haven in the north, and Kenova, Barboursville, Milton, Winfield, Wayne, Hamlin and West Hamlin in the central and southern portions of the region. To meet the large needs of usable water that these centers require the various municipalities and industries are or will have waste abatement programs in effect to insure that a usable supply will be available.

Located in this region are fourteen waste treatment facilities for municipalities; however, certain of these facilities do not operate efficiently enough to meet the water quality standards that have been set by the State. It is felt that most of the existing facilities and all of the proposed facilities should be equivalent to secondary treatment, but the high cost for the construction of these facilities will be a major problem to solve.

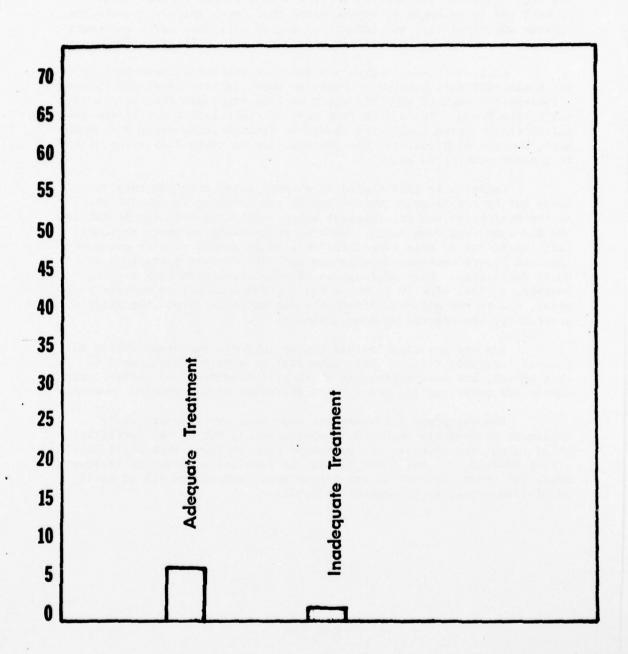
Industry in this region is a large water user and this is borne out by the location since much of the industry is concentrated in the Huntington and Pt. Pleasant areas, with a significant growth in the Big Sandy-Tug Fork Basin. Work is progressing on waste abatement facilities, but at this time there is a large amount of work and money involved toward meeting installation and satisfactory operations of waste facilities. Mine drainage is of some problem in this region; however, at this time it is not a major problem except in certain local areas, due to the efforts of both the mining industry and the state's program for the control of mine drainage.

Another activity in this region includes the construction of a federal reservoir (lake). This lake will be a major development in this region, and interregionally which will provide flood control, water supply and water quality benefits to residents of surrounding counties.

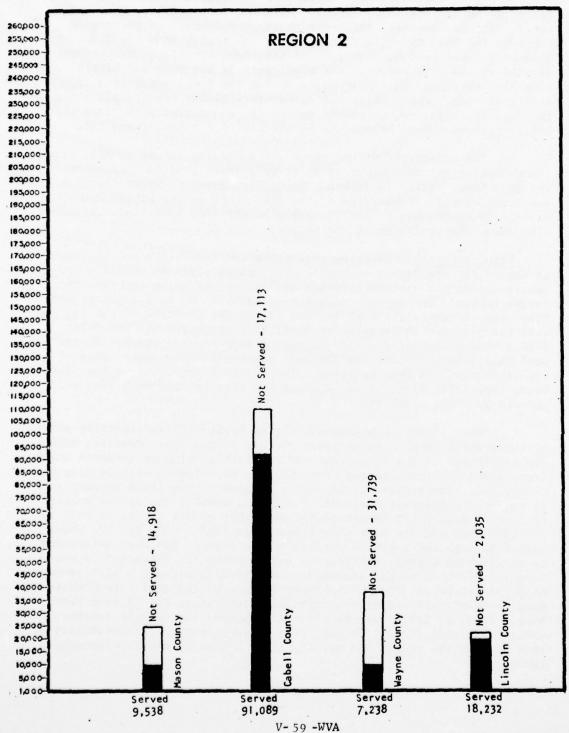
The bar graph illustrations show that the industry waste abatement program has resulted in approximately 80% of the facilities being adequate; however, the municipal program shows that while Cabell County (Huntington) has about 90% of its population served by treatment while the other counties in the region vary from 10% to 35% of their population served by treatment facilities.

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REGION 2
INDUSTRIAL TREATMENT FACILITIES



MUNICIPAL TREATMENT FACILITIES



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REGION III

General. Region III is composed of the eight northwestern counties of Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt and Wood. The most dominant influence on the development of the region has been the Ohio River, which separates the region from the State of Ohio on the west and borders four of its eight counties. Parkersburg, located on the Ohio River at the confluence of the Ohio and Little Kanawha Rivers, has in recent years become the focal point of a remarkable industrial growth which has spread in a linear pattern all along the Ohio River Valley, northward beyond the boundaries of Regions III and IV, and southward beyond the boundaries of Regions II and III.

The topography of the region is generally rather rugged, with the exception of small areas of relatively level land located along the Ohio River Valley in Jackson, Wood, Pleasants and Tyler Counties and along certain tributaries of the Ohio (such as the Little Kanawha River, the Hughes River, etc.). Table 3A provides additional information about the geography of the region.

Transportation. Existing transportation facilities and services in Region III are rather unequally distributed, both in quantity and quality among the various counties and subregions which comprise the larger region. The western counties of Jackson, Wood, Pleasants, and Tyler are currently the most favored of all the counties of the region, with ready access to inexpensive water transportation via the Ohio River; reasonably satisfactory highway transportation via Rt. 2; and good rail transportation via the main east-west-north-south lines of the Baltimore and Ohio Railroad. The interior counties, on the other hand, especially Wirt, Roane, Calhoun and Ritchie, are much less well endowed in these respects.

With regard to highways, most of Region III is presently served by roads which range from mediocre to fair in quality. However, with the completion of the Interstate and Appalachian highway setments which are planned for this region, these highway deficiences will largely be eliminated. Interstate Rt. 77, which is already completed in many sections, will complement State Rt. 2 and will connect the entire western portion of Region III to Charleston and other points south, as well as to Cleveland and the vast mid-western heartland. U.S. Rt. 50, which passes through the northern portion of the region, has been designated as Appalachian Highway Corridor D, and is being reconstructed to conform to modern four-lane standards. Appalachian Highway D will connect with Interstate Rt. 79 at Clarksburg (Region V) and will extend westward to Cincinnati, interconnection with Interstate Rt. 77 near Parkersburg. Finally, Interstate Rt. 79 will traverse the extreme southern portion of Roane County, thereby greatly improving the accessibility of this part of the region and opening it to a host of new developmental influences.

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In the case of rail linkages as in the case of highways, Region III is unequally endowed. Again, it is the western and northern portions of the region which benefit from the best facilities and services while the southern portion is relatively less well endowed. The main east-west line of the Baltimore and Ohio, which connects New York to St. Louis, passes through the region in Ritchie and Wood Counties. At Parkersburg, the line continues southward to Huntington (Region II) where it crosses the Ohio River and continues its westward path. There is also a branch line of the Baltimore and Ohio, which extends northward from Parkersburg paralleling the Ohio River all the way to Pittsburg.

Presently, there is only one commercial airport serving Region III, the Wood County Airport located at Parkersburg. In addition, there is one general aviation airport in the region and this also is located at Parkersburg. A second general aviation airport is currently under construction at Ripley in Jackson County.

Population. In the decade between the census of 1950 and that of 1960, five of the eight counties comprising Region III lost population. (Table 38) The losses ranged from a high of 22.5% in Calhoun County to a low of 4.8% in Tyler County. However, three counties within the region, including the two most populous, Wood and Jackson, gained substantial amounts of population, and their gains were large enough to offset the losses of the other counties of the region. On balance, the percentage regional gain over the decade was approximately 5.4%, representing an absolute increase of 7,894 persons.

On the basis of population estimates for the year 1966, it would seem that the region is continuing to gain population but at a decreasing rate. Again, it is the gains on the part of the three counties of Jackson, Pleasants and Wood, which are responsible for the regional gain. The other five counties of the region appear to continue to be experiencing more or less substantial population losses.

At the time of the 1960 census, only four of the eight counties comprising Region III were recorded as having any urban population at all. Significantly, it was the counties with the greatest percentage of urban population, Wood and Jackson, which exhibited the highest rates of population growth between the years 1950-60 and 1960-66. The declining importance of agriculture and mining in the interior counties (Calhoun, Ritchie, Roane and Wirt), as well as the magnetic attraction of burgeoning industry in the western counties, is possible and plausible explanations of the population trends which have been observed in the region over the last decade and a half.

Employment and Economic Activity. Manufacturing employment is far and away the most important single component of total employment in Region III (though its importance varies widely between the western and interior counties). Available data for 1965 indicates that agriculture

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employed 10% of the total employed (vs. 5.6% in the State); mining employed 3.2% (vs. 8.5% in the State); and manufacturing employed 33.6% (vs. 22.8% in the State). The regional rate of unemployment for the same year was 6.1%, below the State rate of 7.8%, but still above the 4.6% which characterized the nation as a whole. 1965 unemployment rates within the region varied from highs of 15.3% and 10.8% in Calhoun and Roane Counties to lows of 4.9% and 5% in Jackson and Wood Counties (Tables 3C and 3D).

Agricultural activity and employment have been declining substantially in Region III in recent years and especially since the Census of Agriculture of 1954. Many small farms which in previous years were marginal at best became submarginal in the decade between 1954 and 1964 and were abandoned. Between the years 1954 and 1964, the total number of farms in the region decreased more than 46% (from 1,258 to 607) and the total acreage in farms decreased 31.8% (from 1,128,090 acres to 769,202 acres). The value of all farm products sold in the region totalled \$8.3 million in 1964, a decline of about \$.6 million since the agricultural census of 1959. The principal products sold in the region were livestock and livestock products, poultry products and dairy products.

Mining is of relatively less importance in Region III than it is in other regions of the state and in the state in general. In 1965, only three counties, Pleasants, Tyler and Wood, reported mineral production and in the case of all three, actual figures relating to quantities and values of production were witheld for reasons of confidentiality. In all three counties, sand and gravel were the most important mineral products, followed in importance by salt. Tyler County ranked third in the state in value of sand and gravel production and Wood County ranked fifth in this regard.

Manufacturing activity is by far the region's largest employer and the largest contribution to the value of gross regional product. In 1965, manufacturing employment accounted for 33.6% of the total regional employment and, as a glance at the regional map readily indicates, was largely concentrated in centers along the Ohio River Valley and in subcenters located on or near the region's principal transportation links (Ripley and Spencer on Rts. 33 and 119, and Pennsboro on Rt. 50). In the five years between the manufacturing censuses of 1958 and 1963, the value added by manufacturing in Region III increased by a phenomenal 88%. In 1963, value added for the region totalled \$18.7 million or more than 10% of the state total thus placing the region second in West Virginia, after Region I, in the value added by regional manufacturing. The principal products of the region include primary metals, fabricated metals, chemicals, wearing apparel and food products. Some of the firms represented by major installations in the region are: Union Carbide, FMC Corporation, Quaker State, American Cyanamid, Corning Glass, DuPont, Borg-Warner, Carborandum Metals, Kaiser Aluminum, Ravens Metal Products, Textron and others.

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Income. Levels of income vary from county to county in Region III and, generally speaking, exhibit the same variations which are observed among the counties of other "unevenly" industrialized regions such as Regions I, II and V. As one would expect, levels of per capita disposable income and median family income are highest in the industrialized counties such as Wood, Jackson, Pleasants and Tyler, and lowest in counties such as Ritchie, Roane, and Wirt and Calhoun which do not have significant concentrations of employment in high wage manufacturing indusries. The average income (both per capita disposable and family) of Wood, Jackson and Pleasants Counties compare very favorably with those of Kanawha and Putnam Counties (region I), Cabell and Mason Counties (Region II), Monongalia, Harrison, and Marion Counties (Region V) and the heavily industrialized counties which constitute the entirity of Region IV. Nevertheless, the highest levels found in Region III do not quite measure up to national averages for the year 1966. On the other hand, the income levels which characterized Wirt, Roane, Ritchie and Calhoun County in 1966 are comparable to the low levels found in the counties of the most depressed regions of the state and fall substantially short of national averages for the same year.

Problems and Potential. A quick glance at the regional overview map at the end of this chapter points out the importance of the Ohio River in the Region III economy. The major growth resources are situated along the river throughout the Parkersburg-Chio River Supplemental Investment Area. In addition to the availability of low cost river transportation is the much improved highway system and an ample supply of potential industrial sites.

The Spencer Developmental Investment Area is an important service and marketing center for the southern hinterlands of Region III and should continue to develop as an employment center. The Grantsville DIA performs a similar role for the eastern hinterlands of the region. The Pennsboro DIA located on Appalachian Highway Corridor D is an important employment and recreation center for the region, but has not been a major service center because of its ready access to Parkersburg.

One of the major constraints on the development potential of the region is the overall lack of adequate vocational education facilities in the region. This is particularly true in the eastern portions of the region from which the Parkersburg-Ohio River SIA attracts much of its labor force, Improved vocational education facilities appear desirable for the extreme northern and southern portions of the SIA also. Plans for an educational TV system for the region should be accelerated so that this gap in the education system can be closed.

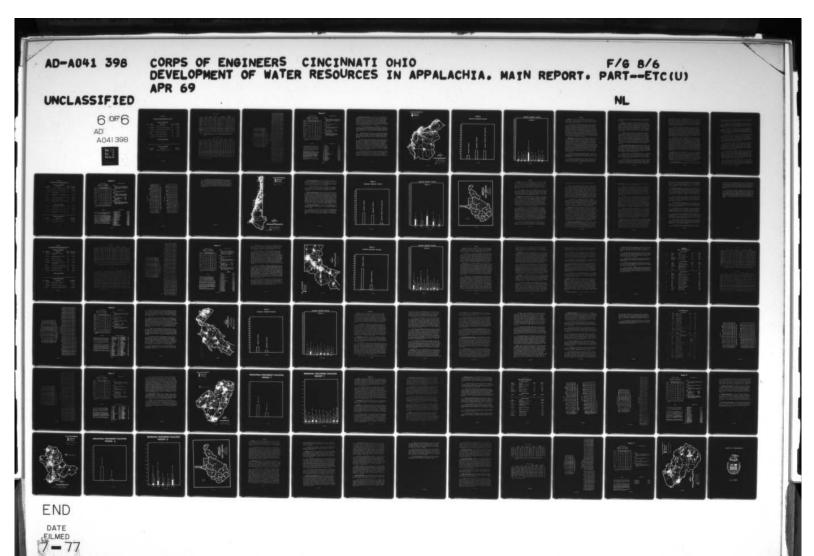
The higher education facilities of the region are somewhat limited, but have been improved significantly in recent years and further efforts should be made in this direction. The extreme northern and southern portions of the region are lacking in this aspect while the central portion is fairly well endowed.

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In the area of water resources, the region should benefit significantly from the proposed reservoir developments on the Little Kanawha River. Also, while the region is somewhat lacking in recreation facilities, ample potential exists to make this one of the region's greatest assets if properly developed.

Though not characterized as most of the state is by obsolescent coaltowns, Region III still is in the need of a well conceived and properly carried out housing program. Such a program is of utmost importance in the SIA so that healthy communities can be developed while at the same time allowing for major industrial expansion. If this is not accomplished, the SIA is likely to develop as a "hodge-podge" of conflicting land uses with the resulting loss of this extremely precious regional resource. Also, efforts should be made to insure that the development of Route 2 as an expressway along the Ohio River is in conformity to the best interest of the region and that this development does not interfere with the developable land.

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REGION III

ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Keyed to Overlay Opposite Page)

APPROVED ARC INVESTMENTS

No.	Location	Description	Section	ARC Funds
1	St. Mary's	Colin-Anderson Center	212	\$ 30,000
2	Parkersburg	W. Va. University-Parkersburg Ctr	. 214	682,439
3	St. Mary's	Colin-Anderson CtrSewage Treat.	214	50,000
4	Grantsville	Calhoun County Library	214	15,845
5	Spencer	Hospital Development Corp.	214	330,000
	Wirt County	Land Conservation Project	203	40,000
	Roane County	Land Conservation Project	203	110,000

PENDING ARC INVESTMENTS

None

APPROVED EDA INVESTMENTS

No.	Location	Description	EDA Funds
1	Spencer	Hospital Development Corporatio	n \$ 330,000

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Table 3-A Geography

Counties	Area (Sq. Mi.)	% Area of State	Area in Farms (Sq. Mi.)	0 / ₀	Area Urban- ized (Sq. Mi.)	9/1	Area Remaining (Sq. Mi.)	97,
Calhoun	281	1.2	130.1	46.3	0.6	. 2	150.3	53.5
Jackson	463	1.9	244.9	52.9	4.4	1.0	213.7	46.1
Pleasants	130	. 5	34. 3	26.4	. 8	. 6	94. 9	73.0
Ritchie	452	1.9	193.0	42.7	3. 2	. 7	255. 8	56.6
Roane	486	2.0	261.5	53.8	1.0	. 2	223.5	46.0
Tyler	256	1.1	110.4	43.1	1.7	. 7	143. 9	56.2
Wirt	234	1.0	81.1	34.6	.4	. 2	152.5	65.2
Wood	368	1.5	146.9	39.9	14.1	3.8	207.0	56.3
Totals for Region	2,670	11.1	1,202.2	45.0	26.2	1.0	1,441.6	54.0
State	24,079	100.0	8, 248. 2	34.3	314.2	1.3	15,516.6	64.4

Sources: U. S. Census of Population 1960; U. S. Census of Agriculture 1964; West Virginia Department of Commerce, Planning and Research Division, "West Virginia Incorporated and Unincorporated Communities."

Table 3-B Population

Counties	Population 1960	Population 1950	% Change 1950-60	Pop. Sq. Mi.	Urban Pop. as % of Total	Rural Farm Pop. as % of Total	Rural Non-Farm Pop. as 7 of Total
Calhoun	7,948	10,259	- 22.5	28	0	23,8	76.2
Jackson	18,541	15,299	21.2	40	33.3	21.0	45.7
Pleasants	7,124	6,369	11.9	55	0	8.4	91.6
Ritchie	10,877	12,535	-13.2	24	0	16.0	84.0
Roane	15,720	18,408	-14.6	32	16.9	23.1	60.0
Tyler	10,026	10,535	- 4.8	39	9.3	17.3	73.4
Wirt	4,391	5,119	-14.2	19	0	36.9	63.1
Wood	78,331	66,540	17.7	213	72.5	3.4	24. 1
Totals for Region	152,958	145,064	+ 5.4	57.3	43.5	11.6	44.9
State	1,860,421	2,005,552	- 7.2	77	38.2	6.5	55. 3
Nation			+11.7	50.5	69.9	7.5	22. 6

Sources: U. S. Census of Population, 1960

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Table 3-C Labor Force 1965

6	15.3	4.8	€.6	9.9	10.8	5.2	5.0	9.0	6.1	7.8	9.4
Unemployment	390	360	140	220	530	178	7.1	1,579	3,468	47,600	3,456,000
6	84.7	95.2	94.4	93.4	89.2	8.4.8	95.0	95.0	93.9	92.2	95.4
Employment	2,160	7,190	2,340	3,090	4,360	3, 229	1,351	30,059	53,779	563,400	72, 179, 000
Labor Force	2,550	7,550	2,480	3,310	4,890	3,407	1,422	31,638	57,247	612,000	78,357,000
County	Calhoun	Jackson	Pleasants	Ritchie	Roane	Tyler	Wirt	Wood	Region	State	Nation

Sources: West Virginia Department of Employment Security; Statistical Abstract of the U. S., 1966

Table 3-P Employment 1965

Total	2,160	7,180	2, 330	3, 100	4,360	3, 229	1,351	30,059	53,769	563,400
Others	280 13.0%	390 5.6	270 12.0	510 16.4	530 12.2	512 14.8	129 9.5	2911 9.8	5532 10.3	58800 10.4
Government	280 13.0%	8.2	21.4	4.8	700 16.0	404 12.7	11.5	11.4	11.8	81500 14.5 5
Gove	280	290	200	260	700	404	155	3445	6334	81500
Services	3.7%	4.0	2.1	3.2	3.0	3.1	5.6	7.9	6.0	0
Ser	80	290	50	100	130	65	107	2373	3229	55600
Finance		1 3	0	1.0	1.4	1.4	5° C	2.0	2.1	+ .
	130 6.09	06	20	30	09	44	30	861	1144	13800
Wholesale ?- Retail Trade	130	630 8.8	280 12.0	230 7.4	460 10.6	2.9 6.2	229 17.0	5091 16.0	7343 13.6	83400 14.8
p. &		1.5	5.1	1.0	3.2	4.4	5.5	5, 5	4.3	7.2
Transp. & Commun.	7.49	110	120	09	140	140	74	1646	2250	100.00
ruct.	160	5.9	1.7	1.6	1.6	2.4	5.9	6.6	5.1	3.0
Construct.		200	40	20	10	92	80	1776	2746	22000
fact.	12.0%	47.7	34.2	23.6	19.7	33,5	34.7	34.7	33.4	12.8
Manufact.	260	3430	800	730	860	1069	469	10431	18049	128600
Mining	260 12.0%	1.4	2.1	14.8	7.8	5.2	1.3	1.2	3.2	8. 5
M	260	100	90	964	340	65	17	373	1725	47800
dture	32.9%	14.6	8.5	9.02	24.5	15.6	3.8	3.8	10.0	5.6
Agriculture	710	1050	200	0+9	1070	447	52	1158	5377	31360
County	Calhoun	Jackson	Pleasants	Ritchie	Roane	Tyler	Wirt	Wood	Region	State

ource. Nest Virginia Department of Emoloyment Security

Region 3

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Plants	No. of Large Plants	No. of	Total Employment
Heavy Manufacturing	22	4	1	27	1,657
Light Manufacturing	48	4	_	52	1,714
Metals	22	4	2	28	5,767
Wood & Paper	29	1	-	30	490
Chemical	4	-	4	8	5,910
Petroleum	3	1	-	4	196
Glass & Pottery	16	7	1	24	2,614
TOTAL	144	21	8	173	18,348

Because symbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

RECREATION

Recreation Resources: Expansive water areas in the slack water pools of the Ohio River provide opportunities for power boating and water skiing. The Little Kanawha River and Middle Island Creek are excellent fishing streams for bass and muskie, and for small craft floating and canoeing. The northeastern area of Region 3 has a good deer herd and small game is found in abundance.

Regional Recreation Areas: State Park - North Bend, awimming, camping, picnicking and fishing. Power boat access sites are programmed at Ravenswood, Farkersburg, Williamstown and St. Marys: fisherman access at locks 19, 20 and 21. Public fishing - Conway Lake; private fishing and camping areas - Hissams Camp, Rippling Waters and Rollins Lake. Public hunting area - Hughes River; public golf at Harrisville; organized camps - Cedar Lakes and Butcher Bend.

Local Recreation Areas: Playgrounds 81, playfields 59, county or city parks 13, county camps 3, swimming areas 10.

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SOCIAL OVERHEAD CAPITAL

Libraries

Region 3 is served by: one large and two smaller libraries in Wood County, one small library each in Wirt and Pleasants Counties and regional libraries in Calhoun, Jackson, Ritchie, Roane and Tyler Counties.

Hospitals

Region 3 is served by seven hospitals with a total bed capacity of 706.

Research Facilities

The three research facilities in this region are: Union Carbide Silicones Division, E. I. Dupont, Marbon Chemical Company.

Colleges

College	Enrollmen
Ohio Valley Jr. College	206
Parkersburg Branch (WVU)	272

Vocational Technical Schools

The major vocational technical schools in Region 3 are located in Wood and Pleasants Counties. The other counties have small vocational training programs.

INDUSTRIAL SITES

1.	Buck Site	83	Acres
2.	Gale Site	231	Acres
.3.	Martin Site	88	Acres
4.	Henderson Site	46	Acres
5.	Keller Site	40	Acres
6.	Borrow Pit Site	50	Acres
7.	Hague Site	48	Acres
8.	Moellendick Site	250	Acres
9.	Weser Site	100	Acres
10.	McDougal Site	167	Acres
11.	Lamp Site	400	Acres
12.	McCoy Site	134	Acres
13.	Belleville Site	600	Acres
14.	Murraysville Site	391	Acres
15.		153	Acres
16.		10	Acres
	Kaiser A & C	625	Acres
	Evans Site	1,289	Acres
	Lane Site	88	Acre
	Enock Site	65	Acre
	Butchers Bend Site	1,300	Acres
	Newark Site	500	Acres
	Grantsville Site	10	Acres
24.		10	Acres
25.	Spencer Site	130	Acres
26.	Spencer Site	5	Acres

Water Resources Activities. Water resources in this region are of major importance to the industries that are located in this region. Parkersburg, located on the Ohio River at the mouth of the Little Kanawha River has in recent years enjoyed a somewhat remarkable growth of industry; thus, in turn, putting a heavy demond on usable water, especially in the Little Kanawha River. Efforts to control wastes from these industries in this area has varied from bad to good. Although most of the industrial plants have a waste abatement program in effect, further work and investment of money will be needed if the quality of the present water supply is to be maintained.

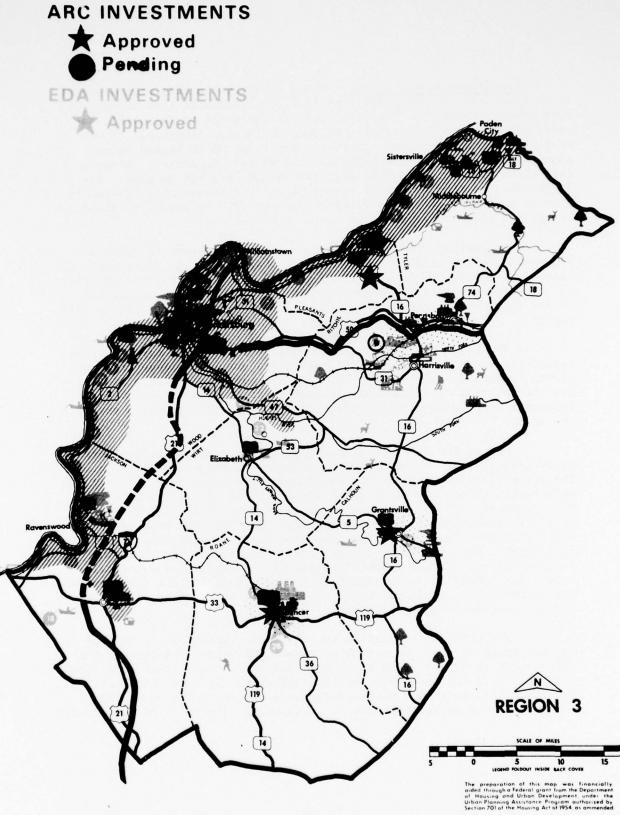
To further enhance this region, the development of two impoundments in the Little Kanawha Basin is being studied. Completion of these impoundments would contribute greatly to the quality and quantity of the present supply. Recreation also would be of great importance to the region since there is relatively little broad water area in this region.

The major municipalities located in this region have provided sewage treatment facilities. Although there are some eleven treatment plants located in this region, the need for additional plants is great and the existing facilities are in need of up-grading to secondary treatment to maintain water quality in line with the standards set by the State.

One of the major problems relating to water pollution control activities in this region is the development of large oil deposits. The oil wells were producing 20 to 30 barrels per day each; however, to each barrel of oil produced, up to three barrels of salt water were also produced. In disposing of these large amounts of salt water, initially ponds and discharge to the serving stream was practiced. Since that time injection wells have been installed for disposal of the salt water. The small size of the serving stream has magnified the presense of salt to the extent that relatively small amounts of salt causes the waters to be unusable for normal use during low flow periods. The presence of a municipal water supply on this stream has increased the seriousness of the pollution.

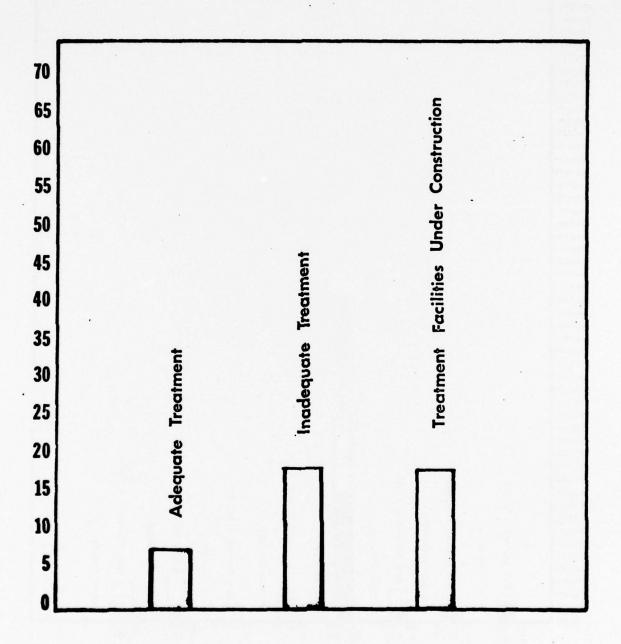
The problem involved in the oil field operation is verified in the bar graph showing the status of industrial wastes treatment. The information shown was taken from May 1967 data. Since that time, practically all of the treatment construction shown has been completed. The graph illustrating domestic waste treatment progress shows the counties treatment varying from no treatment to about 60% in Wood County.

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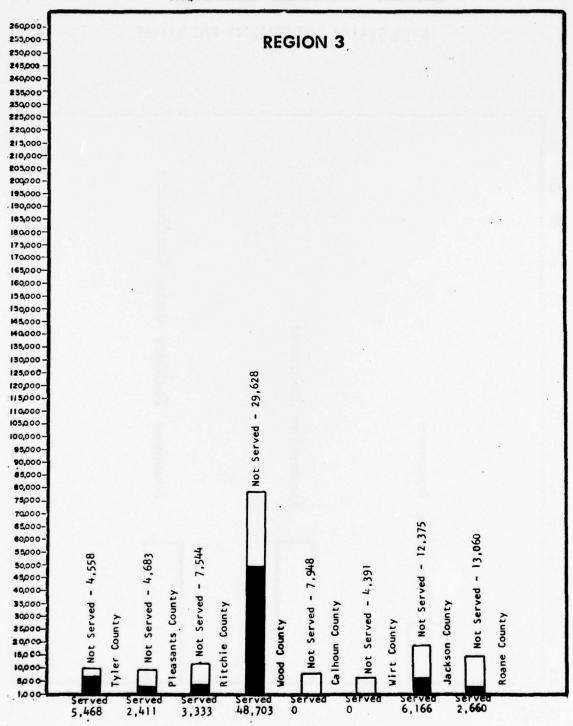


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REGION 3
INDUSTRIAL TREATMENT FACILITIES



MUNICIPAL TREATMENT FACILITIES



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REGION IV

General. Region IV is one of the most highly industrialized regions of the State and, likewise, one of the most prosperous. It is relatively well equipped with air, rail and water transport facilities and it benefits, from close proximity and easy access to major population centers to the east and west.

The geography of Region IV has been greatly influenced by the Ohio River, which forms its norther and western boundaries and which separates it from the State of Ohio. The regional topography varies from the level bottomland of the Ohio River Valley and the valleys formed by its tributaries to rolling hills further to the east and along the State's boundary with Pennsylvania. Wetzel County, especially the southeastern portion, is characterized by more rugged topographical features. The Ohio River has long been the dominant influence on the development of the region, and it was along its banks that the first major population settlements and centers of economic activity developed. The river's influence continues to be felt today, and the vast majority of the region's total population and industrial installations are located in close proximity to the major waterway. Table 4A provides additional information about the geography of the region.

Transportation. The Ohio River, which connects the major population and economic centers of Region IV to the Pittsburgh Region to the east and to the great hinterland of the Mississippi River system to the south and west, is perhaps the dominant feature of regional transportation. However, the region is also well equipped with road and rail transportation facilities, and to a somewhat lesser degree by air transportation facilities. Interstate Highways 70 and 470 traverse the region in its midsection and serve to connect Wheeling with important centers such as Columbus and Indianapolis in the west and Pittsburgh in the east. U.S. Rt. 22, which traverses the region in the north, connects Steubenville on the west bank of the Ohio and Pittsburgh in the east with the important regional center of Weirton. St. Rt. 2, which parallels the Ohio River along its course from north to south interconnects virtually all the important centers of the region and thus provides an excellent intra-regional, as well as interregional transportation linkage.

Railroads serving the region include the Baltimore and Ohio, the Pennsylvania, and the Norfolk and Western system. A glance at the regional map indicates that the main and branch lines of these systems provide excellent intra-regional as well as inter-regional and interstate linkages.

Presently, the Wheeling-Ohio County Airport at Wheeling is the only commercial airport within the region. From Wheeling, there are regularly scheduled flights to Pittsburgh, Columbus, Morgantown, and Parkersburg, and the Greater Pittsburgh Airports provides the region

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with excellent air service. In addition, there are two general aviation airports located in the region, one at Moundsville and the other at Weirton.

Population. The population of Region IV increased moderately (2.3%) over the decade 1950-60. Hancock, Brooke, and Marshall Counties gained population (15.2%, 7.6%, and 3.1%, respectively) while Ohio and Wetzel Counties both lost in the neighborhood of 4% over the 10-year period. It has been estimated that the 1966 regional population is somewhat less than that recorded in 1960 (192,000 vs. 194,380). This slight decline in population (on the order of 1%) is largely attributable to continued out-migration from Ohio County, the most populous county in the region and the county which lost most rapidly during the decade 1950-60.

Taken as a whole, Region IV is the most highly urbanized of the nine economic regions in the State. In 1960, almost 70% of the regional population resided in urban areas as compared to 55.8% in Region I and 51.4% in Region II, the second and third most urbanized regions of the State. Conversely, Region IV has the smallest percentage of rural non-farm population of any region in the State. With respect to rural farm population as a percentage of total population, Region IV with 2.5% in 1960 ranked third after Region IX (1.2%) and Region I (1.9%). If Wetzel County (which in several respects differs importantly from the other counties of the region) were excluded from consideration, the percentages of rural farm and rural non-farm population in the region would be significantly lower than those given. (Table 4B)

Employment and Economic Activity. Employment data available for 1965 indicates that, from the employment point of view, manufacturing is far and away the most important activity in Region IV. The region percentage was almost 40% (as compared to 23% for the State) and ranged from a high of 61% in Hancock County to a low of 24% in Marshall County. The second and third most important sources of employment in the region were wholesale and retail trade, whose respective shares of total regional employment were 15.4 and 8.9 percent.

Among the counties comprising the region, the rate of unemployment in 1965 varied from a low of 3.1% in Hancock County to a high of 6.7% in Marshall and Ohio Counties. This was the lowest in the State (State average - 7.8%), but still somewhat higher than the national level. The 1965 level of unemployment in the region was on the order of 5.5%. (Tables 4C and 4D)

Agriculture as a source of employment is relatively unimportant in Region IV. In conformance with trends observed elsewhere in the State and nation, the number of farms and the number of people living and working on farms have been steadily declining. In Region IV only Marshall and Wetzel Counties have significant numbers of farms and

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only in Wetzel County does farm employment constitute a significant percentage of total county employment (15.6% in 1965). In this connection, it is interesting to note that in Wetzel County farm families have the lowest standard of living of all farm families in the region; that commercial farms in the lowest class constituted the vast majority (67.4%) of all commercial farms in the county; and that in the decade 1954-64 the number of farms declined at a rate much more rapid than in any other county in the region.

Manufacturing, as has been noted, is the principal employer in Region IV. In 1963, the value added by regional manufacturing amounted to \$147.5 million (8% of the State total) and placed the Region fourth behind Regions III and V. On a regional basis manufacturing employment is concentrated in primary metals processing, metal fabrication, glass and pottery, chemical and allied industries, and the manufacture of non-electrical machinery. Locally important industries are the wood and paper products industry in Brooke County and the petroleum industry in Wetzel County. A glance at the regional map readily conveys an idea of the distribution and extent of concentration of industrial installations in the Ohio River Valley.

Information relating to mining activity in the region is not readily available due to restrictions placed on disclosure of information relating to the operations of individual firms. From the point-of-view of employment mining is not of great importance, constituting as it does only between 3% and 3.8% of the total employment of Marshall, Ohio, and Wetzel Counties. It is known, however, that Marshall County is the State's leading producer of salt (even though the value of salt production lags behind that of coal in the county); that Hancock County ranks second in the State in the value of its clay production, and that Ohio County ranks fourth in the State in the value of its sand and gravel production. The recently started project by the American Electric Power System to build a \$200 million electric generating plant in the region should augur well for employment in the coal mining industry, as well as the transportation and construction industries operating within the Region.

Income. As has been noted, Region IV is one of the more developed and prosperous regions of the State. Two of the counties of the region - Ohio and Hancock - had levels of per capita disposable income which exceeded the national average in 1966 and the other three counties of the region came close to equalling the national figure. With regard to median family income, the region fared equally well in 1966. Such income varied from a high of \$7,440 for Hancock County to a low of \$5,676 for Marshall County. Marshall and Wetzel Counties, the least industrialized of the region's five counties had the region's lowest figures for both median family income and per capita disposable income.

Problems and Potential. In many economic aspects, parts of Region IV rank not only among the more prosperous in the State, but in the

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nation as well. Ohio County, which has a per capita disposable income of \$2,674 ranks ahead of 97 percent of all U.S. counties, while Hancock ranks ahead of 95 percent of all U.S. counties.

The regional overview map at the end of the chapter illustrates the concentration of the developmental resources in the region. Though the region compares well with any in the state, it continues to suffer population losses and needs significant improvement in its living environment if it is to compete nationally.

As in Region I, air pollution is a serious environmental problem that must be overcome if the region is to retain its prosperous position. This problem is even more complex in Region IV, because it will require cooperation and action on the part of three states if it is to be solved. Nevertheless the solution to this problem is essential to the region's well being.

Improvements to the region's health facilities are also needed if Region IV is to continue to prosper. The region's higher education facilities are good, except for in the southern part of the region where such a facility would be desirable to serve southern Region IV, as well as northern Region III. While the region is endowed with some of the best recreational facilities in the state, the high population densities place tremendous burdens on the existing facilities, and additional investments are needed in this area.

The most serious constraint on the future development of Region IV is the relatively poor condition of its housing stock in numerous areas and the poor environmental condition of many areas. While the serious air pollution problems contribute to this overall situation, age and the lack of development controls make many parts of Region IV undesirable places to live. Corrective measures, including a major housing program, must be undertaken if Region IV is to correct this most serious development constraint.

The major highway investments that have been made in Region IV interstate highways in recent years have greatly improved the region's access to its major markets. However, additional improvements are critically needed in the region's interregional highway system. The planned reconstruction of Rt. 22 in the northern part of the region should be accelerated as should the much needed improvements to Rt. 2 in many parts of the region. Efforts must be made within the region to remove any obstacles which may be in the way of these projects since they are essential to Region IV's economic future.

While the region in general has some of the best vocational education facilities, additional ones are needed to provide a wider range of program types in an effort to keep more of the region's young people in its labor force. The continual high rate of out-migration of the region's newcomers to the labor force cannot be tolerated in the future if the region is to grow significantly.

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REGION IV

ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Keyed to Overlay Opposite Page)

APPROVED ARC INVESTMENTS

No.	Location	Description	Section	ARC Funds
1	Cross Creek	Brooke Cty. Compre. High School	211	\$ 680,500
	Cross Creek	Brooke Cty. Compre. High School	214	369,000
2	West Liberty	West Liberty St. College Fine Arts Building	214	41,725
3	Wheeling	West Liberty St. College Wheeling Center	214	109,544
4	Bethany	Bethany College Fine Arts. Bldg.	214	99,695
5	Wheeling	Wheeling College Library	214	100,000
6	Roney's Pt.	Northern Panhandle Rehabilitation Center	214	154,965
		PENDING ARC INVESTMENTS		
7	Hancock Cty.	Airco Arroyo Ind. Site Access Road 0.62 miles	201	24,500
8	Ohio & Brooke Cties.	Wheeling-Ohio Cty. Airport Access Road 1.01 miles	201	280,000
9	Wheeling	Northern Panhandle Mental Health Center	214	170,176
		APPROVED EDA INVESTMENTS		
No.	Location	Description		EDA Funds
1	Wheeling	Wheeling Municipal Auditorium		\$1,833,000
-	Wheeling	Extend Wheeling Water Lines		308,000

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Region 4

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Flants	No. of Medium Plants	No. of Large Plants	Total No. of Plants	Total Employment
Heavy Manufacturing	34	8	2	44	4,166
Light Manufacturing	62	6	-	68	2,224
Metals	28	5	7	40	17,167
Wood & Paper	16	2	-	18	785
Chemical	4	2	2	8	2,235
Petroleum	8	1	-	9	146
Glass & Pottery	7	3	3	13	4,688
TOTAL	159	27	14	200	31,411

Because symbols on overlay are by.city and not by plant there will not be a symbol for every plant listed on this table.

SOCIAL OVERHEAD CAPITAL

Libraries

Region 4 is served by: one large library in Ohio County, one large and one smaller library in Hancock County, two small libraries in Brooke County, and regional libraries in Marshall and Wetzel Counties.

Hospitals

Region 4 is served by nine hospitals with a total bed capacity of 1,353.

Research Facilities

The four research facilities in this region are: National Steel Corporation, Office of Coal Research Pilot Plant (Consolidation Coal), Mobay Chemical Co., PPG Chemical Division.

Colleges	
College	Enrollment
West Liberty State College	2,731
Hancock Branch (West Liberty)	318
Bethany College	1,102
Wheeling College	800

Vocational Technical Schools

The major vocational training schools in Region 4 are located in Ohio, Marshall and Mancock Counties. Brooke and Wetzel Counties have small vocational training programs.

RECREATION

Recreation Resources: The expansive Ohio River provides power boating and water skiing. There is a fair deer herd in Wetzel and part of Marshall County. Small game is found in the nonurban areas of Region 4.

Regional Recreation Areas: Oglebay Park, a metropolitan regional park, provides a complete range of outdoor recreation and special cultural facilities. State Areas: Tomlinson Run Park provides swimming, boating, picnicking and organized camping. Public hunting is provided at the Lewis-Wetzel public hunting area. Bear Rocks, Castleman Run and Burches Run Lakes are additional fishing areas; power boating access to the Ohio exists at New Cumberland and Wellsburg and is anticipated at Weirton and New Martinsville, Public golf areas exist at New Martinsville, Wheeling and Weirton. Potential regional recreation areas are Brook Hills Park and the Grave Creek Mound.

Local Recreation Areas: Playgrounds 108, playfields 82, county and city parks 16, county camps 1, swimming pools 13.

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INDUSTRIAL SITES

1.	Knowles Plant and Site	40	Acres
2.	Fort Pitt Bridge Site	79	Acres
	. Marshall Site	40	Acres
4.	Monongahela Power Site	271	Acres
5.	Valentine Clay Site	20	Acres
6.	Beechbottom Site	150	Acres
7.	Monongahela Power Site	30	Acres
8.	Pennsylvania R R Site	8	Acres
9.	Pennsylvania R R Site	5	Acres
10.	Wheeling Steel Site	8	Acres
11.		20	Acres
	Consol Coal Site	25	Acres
	B & O R R Site	19	Acres
	Standard Slag Site	14	Acres
	Wheeling Bronze Site		Acres
	PPC Site	50	Acres
	Consol Coal Site	20	Acres
18.	Reed Site	47	Acres
	Neil Site	450	Acres
	Moundsville Site	200	Acres
	Cameron Site	10	Acres
	Wells Site	82	Acres
	B & O R R Site	100	Acres
24.		12	Acres
25.	New Martinsville Site	55	Acres

Table 4-A Geography

*	43.2	49.2	37.0	32.7	10.9	51.2	64.4
Area Remaining (Sq. Mt.)	38.4	40.3	113.4	35.0	256.6	483.7	1.3 15,516.6
*	23.7	25.1	2.3	15.0	1.3	7.3	1.3
Area Urban- ized (Sq. Ml.)	21.1	20.6	7.0	16.0	4.8	69.5	314.2
ĸ	13.1	25.7	60.7	52.3	27.8	41.5	34.3
Ares in Farms (Sq. Mi.)	29. 5	21.1	185.6	56.0	100.6	392.8	8, 248. 2
% Area of State	•	1	1.3	•	1.5	3.9	100.0
Area (Sq. Mi.)	68	82	306	107	162	946	24,079
Countles	Brooke	Hancock	Marehall	Ohto	Wetzel	Totals for Region	State

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Sources: U. S. Census of Population 1960, U. S. Census of Agriculture 1964; West Virginia Department of Commerce. Planning and Research Division, "West Virginia Incorporated and Unincorporated Communities."

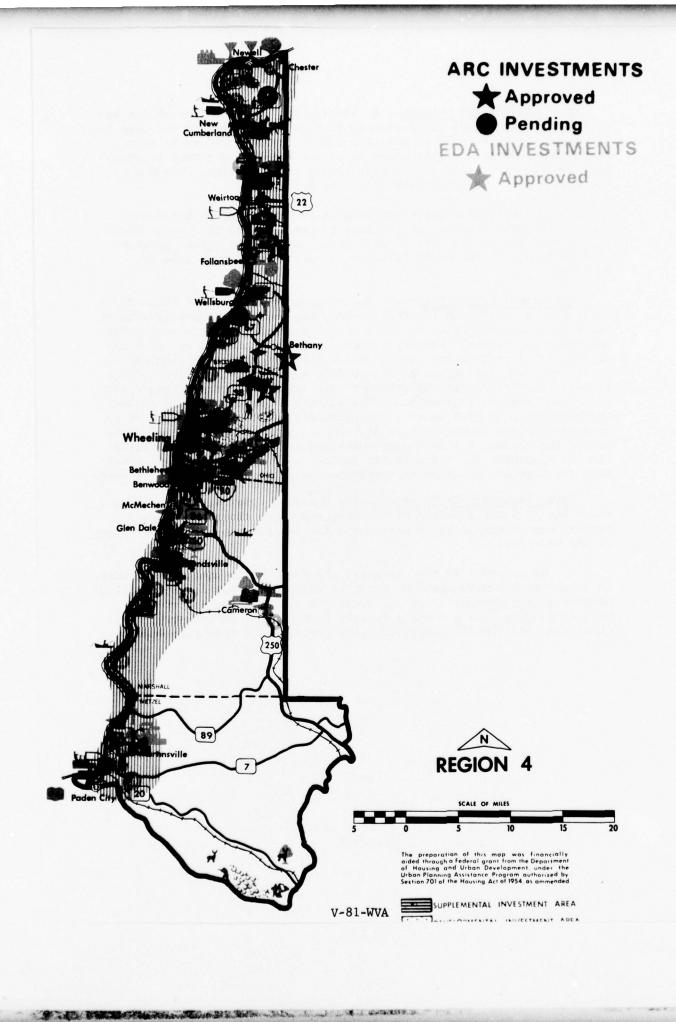
Table 4-B Population

Countles	Population 1960	Population 1950	% Change 1950-60	Pop. Sq. Mt.	Urban Pop. as % of Total	Rural Farm Pop. as % of Total	Rural Non-Farm Pop. as % of Total
Brooke	28,940	26,904	1.6	325	54.4	1.7	43.9
Hancock	39,615	34,388	15.2	483	70.3	6	28.8
Marshall	18,041	36,893	3.1	124	55.2	7.2	37.6
Ohto	1,8,437	11,672	- 4.5	640	87.1.	1.3	11.6
Wetzel	19, 347	20,154	0.4.	53	40.4	2.0	57.6
Totals for Region	194,380	190,011	+2.3	205. 5	67.9	2.5	29.6
State	1,860,421 2,005,552	2, 005, 552	-7.2	11	38.2	6.5	55.3
Nation			+11.7	\$0.5	6.69	7.5	97.22

Sources, II. S. Census of Population, 1960

This region, which borders the Ohio River from the Pennsylvania-West Virginia border, comprises five counties. Within this area is light and heavy industry, larger cities and small communities with definite expansion potentials in most areas. The Ohio River, which is becoming almost completely canalized in this area, is changing in its assimilative capacity due to this changing environment. One high level river lock and dam was recently completed near Wheeling and another one is under construction some forty miles downstream at New Martinsville.

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Municipal Wastes Program. As illustrated in the bar graph for Region \overline{IV} , the municipal waste program in this area is one of the best in the State, if considered on a region basis; however, it can be seen that Brooke County has only about 7% of its population served by treatment facilities whereas the largest county in population, Ohio County, has some 80% of its population served by treatment.

The pollution abatement program of the State, in accordance with the Orsanco program, is intended to correct much of this problem in the next five years. As is well known, the federal grant program will certainly be the basic indicator of progress in this area of treatment.

Industrial Wastes Program. The only major basic steel industry in the State is located in the Weirton-Wheeling area. A five-year plan at the region producer ended recently with the completion of a complex of treatment facilities. Further efforts at waste abatement are underway at this facility to remove additional waste products. The chemical industry has some four major plants located along the Ohio River in this region. Varying degrees of treatment are provided at these plants with additional treatment earmarked. The pottery industry, located in the northern area, is also under a pollution abatement program relative to suspended solids removal. Mine drainage is evident in localized areas within the region, and one large operation is now completing installation of treatment facilities while another operation has a pilot treatment facility in operation to determine the final procedures to be used.

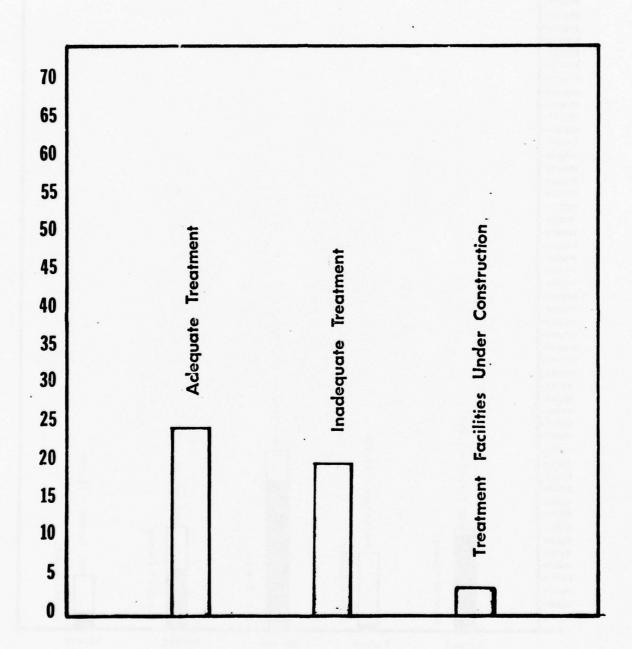
Water Resources Development. The Wheeling Creek Watershed Compact, which was recently approved by the Congress, is a two-state compact between West Virginia and Pennsylvania for the comprehensive development of the watershed.

Of interest in this area are the flood plain management studies to be undertaken with the U.S. Corps of Engineers. Due to the flooding history of the Ohio River in the area, the outcome of these studies will definitely have a bearing on many developments of industry, municipalities and other interests slanted toward water resources development.

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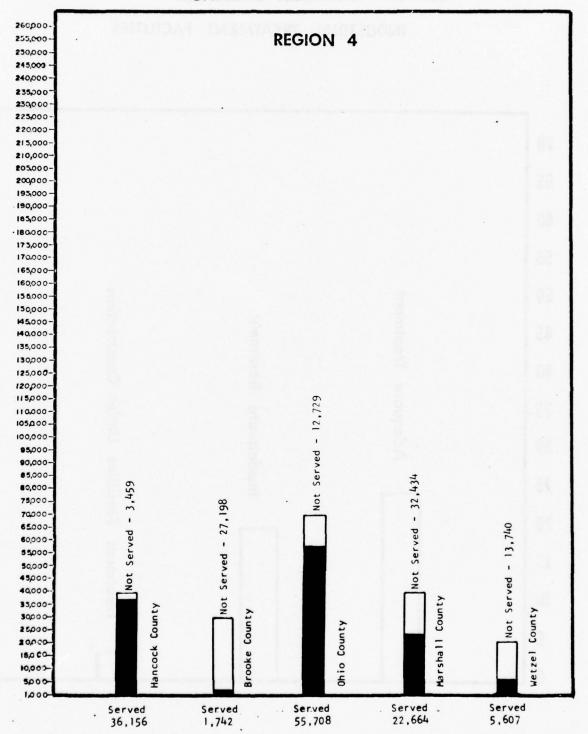
REGION 4

INDUSTRIAL TREATMENT FACILITIES

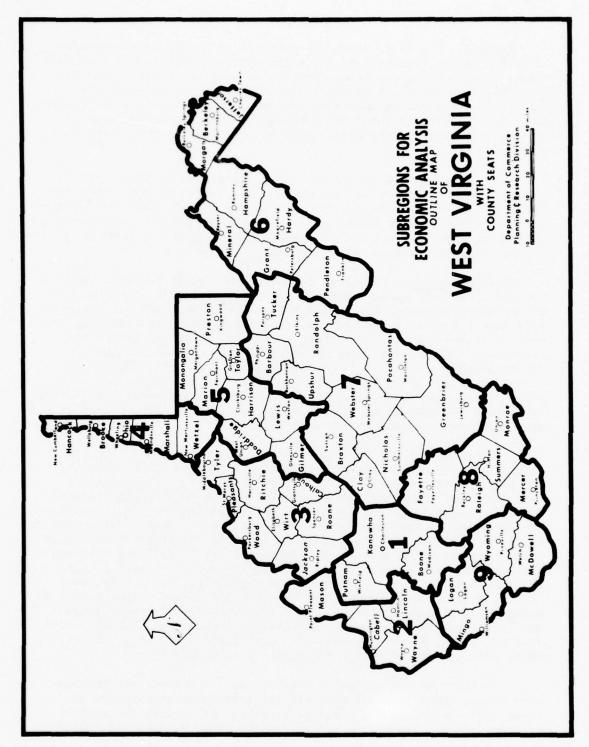


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MUNICIPAL TREATMENT FACILITIES



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REGION V

General. Region V, sometimes referred to as the Upper Monongahe-la Valley Region, consists of the eight north-central counties of Dodd-ridge, Gilmer, Harrison, Lewis, Marion, Monongalia, Preston, and Taylor. It is an important manufacturing region and ranks among the highest in the State in the value added by its manufacturing industries. The region is also an important producer of coal, stone and clay in 1965 ranked fourth in the State in terms of the value of its mineral production.

The topography of Region V is generally quite rugged with many steep slopes rising from narrow valleys to mountain ridges. Only Preston County in the extreme eastern part of the region, adjacent to Maryland, contains a major amount of level land, and this is found principally along river valleys and in plateau areas. Table 5A provides additional information about the geography of the region.

Transportation. Existing transportation facilities within Region V would have to be rated "fair" in quality. As in many other regions of the Mountain State, the rugged topography of Region V has historically constituted a barrier to the development, expansion, and improvement of transportation facilities, particularly highway facilities. Inadequate highway links with the rest of the State and nation have unquestionably placed the region at a comparative disadvantage and served to retard its economic development. The completion of Interstate and Appalachian highways projected for the region will undoubtedly improve the competitive position of regional industry and act as a spur to future economic growth within the region.

Interstate Rt. 79, probably the most important of the projected highways which will be constructed in Region V will traverse the region longitudinally from north to south and will connect its most important population and industrial concentrations (Morgantown, Fairmont, Clarksburg, and Weston) to the Pittsburgh metropolitan area to the north and the Charleston metropolitan area to the south. Interstate 79, in turn, will be complemented by the construction of Appalachian highways which will greatly improve intraregional-interregional communication and open up the entire region to a wide range of new developmental influences. Appalachian Highway E, for example, will connect Morgantown to Cumberland, Maryland and thence to Interstate 70. Appalachian Highway D will connect Clarksburg to Parkersburg (Region 3) and thence to Interstate Rt. 77. Finally, Appalachian Highway H will link Regions V, VI and VII, and will give large portions of all of these regions easy access to Interstate Rts. 81 and 66.

There is one navigable waterway in the region, the Monongahela River, and this river provides inexpensive transportation of industrial raw materials, finished products, etc., from the region northward to the industrial centers of the Lower Monongahela Valley,

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to Pittsburgh, and to the vast hinterland of the Ohio-Mississippi River system.

With respect to railways, at least certain portions of the region (particularly the northern portion) are relatively well served. The main line of the Baltimore and Ohio Railroad from New York to St. Louis enters the region at a point near Terra Alta in Preston County and continues on a westward course which takes it through or near such regional centers as Grafton, Bridgeport, Clarksburg, Salem, and West Union. Branch lines of the Baltimore and Ohio criss-cross the entire northern portion of the region connecting the various centers of the region with both Pittsburgh and the industrial centers of Region IV. There is also a line of the Monongahela Railroad which connects Clarksburg with points north and parallels the Monongahela River on its west bank from Fairmont to a point north of Morgantown. Finally, another branch line of the Baltimore and Ohio System passes through portions of Lewis and Gilmer Counties in the extreme southern part of the region.

In the area of air transportation, Region V is relatively well equipped and well served. There are presently two commercial airports in the region, the Benedum Airport serving the Bridgeport-Clarksburg area and the Morgantown Municipal Airport serving the Morgantown area. Both airports are served by regularly scheduled flights of Lake Central Airlines. In addition, to these commercial-general aviation airports, there are two exclusively general aviation airports in the Region, one serving Fairmont and the other serving Kingwood.

Population. During the decade between 1950-60, every county comprising Region V lost population (Table 5B). The overall regional loss was approximately 11%. The highest rates of population decline were observed in Doddridge, Taylor, and Gilmer Counties (22.8%, 18.5% and 17.4% respectively) while the lowest rates were observed in Lewis, Monongalia, and Harrison Counties (6.5%, 8.5% and 8.7% respectively). On the basis of population estimates for the year 1966, it would appear that the region as a whole is continuing to lose population, though at a decreasing rate. The percentage loss for the six-year period is estimated at 4% (from 274,164 to 263,200). Declining employment in traditionally important activities (especially agriculture and mining) as well as an inability of the regional economy to create enough new employment opportunities to absorb those displaced from these activities and those newly entered into the labor market would appear to be the major reasons for the continued decline in regional population.

Employment and Economic Activity. The principal sources of employment in Region V (a part from wholesale and retail trade and other service sectors) were manufacturing, mining and agriculture. In 1965, manufacturing employed 20.7% of the total employed (vs. 22.8% in the State); mining employed 11.3% (vs. 8.5% in the State); and agriculture employed 5.2% (vs. 5.6% in the State). The regional rate of unemployment for the same year was 6.5%, below the State rate but still

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above the rate which prevailed in the nation at that time. Gilmer County exhibited the highest rate of unemployment (11.4%) while the lowest rate was to be found in Marion County (5.0%).

Agriculture has been declining in Region V in recent years much as it has been elsewhere in the State. Between 1954-64, the number of farms in the region decreased 42.9% from 10,903 to 6,228, and the total farm acreage declined 26% from 1,209,962 acres to 895,926 acres. Nevertheless, from the points of view both of employment and of contribution to the gross regional product, agriculture continues to be a significant element of the regional economy. In 1964, the total value of farm products sold in the region amounted to \$13.9 million or 15% of the total value of all farm products sold in the State (Table 5C and 5D).

Region V is also one of the principal coal producing regions of the State and annually produces about one quarter of the total State production of bituminous coal. Within the region, Marion County is the principal producer and ranks fifth in the State. Because of the non-disclosure rules relating to operations of individual mining firms, it is difficult to obtain reliable estimates of the total quantity and value of coal production in the region. In 1965, quantity mined was probably in excess of 25 million tons and the value of marketed production in excess of \$150 million. Total mining employment in the region amounted to nearly 10,000, almost one third of which was concentrated in Marion County. Harrison, Marion, Monongalia, and Preston County together accounted for over 89.6% of total regional employment in mining.

Manufacturing, as has been previously noted, is the largest single employer in Region V and accounts for approximately 21% of total regional employment. In 1963, the value added by regional manufacturing amounted to \$148.2 million, or slightly more than 8% of the State total. This placed the region in third place, after Region I (\$623 million) and Region III (\$187.7 million) and slightly ahead of fourth placed Region IV (\$147.5 million). The manufactured products of Region V include primary metals, fabricated metals, wearing apparel, wood products, and, most notably, products made of glass. The cities of Morgantown, Fairmont, Clarksburg, and Weston have long been famous for the high quality glass products produced by their factories.

Income. Figures for per capita disposable income and median family income vary widely among the counties which are most populous, most highly urbanized, and most industrialized - Monongalia, Harrison and Marion - which have the highest levels of income. Conversely, those counties which have little urban population, heavy concentrations of employment in agriculture and mining, and high levels of unemployment - Gilmer, Doddridge, and Preston - are observed to have the lowest income levels. It should be noted, however, that in no instance do median income figures for the counties comprising Region V exceed, equal or even approach the median levels observed in the nation as a whole. Marion

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County led the region in 1966 with an estimated per capita disposable income of \$2,171. Gilmer County occupied last place with a per capita income of \$1,291 and a median family income of \$3,650. These figures compare to an estimated 1966 median family income of just under \$7,000 and an estimated 1966 per capita disposable income of \$2,367 for the nation as a whole.

Problems and Potential. The major developmental influence in Region V is the Clarksburg-Fairmont-Morgantown Supplemental Development Area as illustrated on the regional overview map at the end of the chapter. This SIA has played an important role in the region's past and will make a major contribution to the future development of Region V. This region is also blessed with a number of strong Development of Investment Areas in Kingwood, Grafton, Weston, Glenville and Salem-West Union.

While the others are well established, Salem-West Union is new to this role and is expected to play such a role mainly because of the developmental influence of the Appalachian Corridor D. Weston is the only other DIA in Region V that will have significantly improved access. The others will continue to serve as service employment centers for their respective hinterlands.

The Clarksburg-Fairmont-Morgantown SIA will be greatly influenced by the development of Appalachian Corridors E & D as well as by Interstate 79. Combined with the many potential industrial sites this area should prosper significantly if the proper public investments are made to complement its potential.

Proposed water resources developments for the region should be of great significance not only in preventing flood damage but also in guaranteeing adequate supplies of good water. However, those must be combined with concerted efforts to clean up residential and industrial pollution if the region is to have a safe and healthy environment.

Additional vocational education facilities are needed in the outlying sections of the SIA as well as in several of the DIA's. The planned educational T.V. system should benefit the region and all efforts should be made to carry it to every part of the region. The region is well served by higher education facilities and should be able to utilize this resource in its developmental efforts.

While being quite scenic, the region does not have an adequate supply of recreational facilities and should make efforts to develop additional facilities in relation to the pending water resource developments. Efforts are also needed to upgrade the living environment and housing stock in many sections of the region.

Strip mining is a serious problem in Region V and efforts are needed to reclaim vast areas of the region. While recently inacted

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strong controls on strip mining should do much to prevent this problem from growing worse, these controls will not remove the blight of past strip ming. Efforts both public and private should be made in Region V to reclaim these devastated lands and wipe out their blighting effect. Efforts should be made to incorporate these needed land reclamations with the planned water resource and recreation development of the region.

Current indications are that coal mining will continue to be an important segment of the Region V economy. The quality of the mined coal from the region is excellent and demands for it are expected to grow. However, automation in mining will continue to raise production per employee and the region should not expect a major expansion in coal mining employment. Instead, efforts must continue to bring about an expansion of the manufacturing and service sectors of the Region V economy to provide employment for the potential expansion in the labor force.

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REGION V

ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Keyed to Overlay Opposite Page)

APPROVED ARC INVESTMENTS

No.	Location	Description	Section	ARC Funds
1	Harrison Co.	Salem College Access Road - 0.76 miles	201	\$ 245,000
2	Gilmer Co.	Glenville State College Access Road - 0.20 miles	201	35,000
3	Weston	Weston State Hospital	214	52,500
4	Morgantown	W. Va. University Ed. T.V.	214	313,724
5	Glenville	Glenville State College Class- room Building	214	125,000
6	Salem	Salem College Science Building	214	200,000
7	Monongah	St. Barbara's Nursing Home Addn.	214	50,000
8	Kingwood	Kingwood Public Library	214	35,574
9	Preston Co.	Land Conservation Project	203	120,000

PENDING ARC INVESTMENTS

None

		APPROVED EDA INVESTMENTS	
No.	Location	Description	EDA Funds
1	Bridgeport	Benedum Airport Terminal Bldg.	\$ 222,000
2	Bridgeport	Bridgeport Water System	194,000
3	Clarksburg	Harrison Co. Industrial Park Dev.	14,000
4	Weston	Stonewall Jackson Memorial Hospital	1,066,000

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Table 5-A Geography

Counties	Area (Sq. Mi.)	% Area of State	Area in Farms (Sq. Mi.)	9/0	Area Urban- ized (Sq. Mi.)	σ_{f_c}	Area Remaining (Sq. Mi.)	o _{j,}
Doddridge	319	1.3	153.2	48.0	. 4	. 1	165.4	51.9
Gilmer	339	1.4	141.9	41.9	1.4	. 4	195.7	57.7
Harrison	418	1.7	233.3	55.8	10.3	2.5	174.4	41.7
Lewis	392	1.6	205.3	52.4	1.8	. 5	184.9	47.1
Marion	309	1.3	129.7	42.0	13.0	4.2	166.3	53.8
Monongalia	365	1.5	156.7	42.9	8.0	2.2	200.3	54.9
Preston	645	2.7	287.7	44.6	5.6	. 9	351.7	54.5
Taylor	170	. 7	91.9	54.1	2.5	1.5	75.6	44.4
Totals for Region	2,957	12.2	1,399.7	47.3	43.0	1.5	1,514.3	51.2
State	24,079	100.0	8,248.2	34.3	314.2	1.3	15,516.6	64.4

Sources: U. S. Census of Population 1960; U. S. Census of Agriculture 1964; West Virginia Department of Commerce, Planning and Research Division, "West Virginia Incorporated and Unincorporated Communities,"

Table 5-B Population

Counties	Population 1960	Population 1950	% Change 1950-60	Pop. Sq. Mi.	Urban Pop. as% of Total	Rural Farm Pop. as % of Total	Rural Non-Farm Pop. as o of Total
Doddridge	6,970	9,026	-22.8	22	0	17.8	82.2
Gilmer	8,050	9,746	-17.4	24	0	21.5	78.5
Harrison	77,856	85,296	- 8.7	186	45.0	4.3	50.7
Lewis	19,711	21,074	- 6.5	50	44.4	11.8	43.8
Marion	63,717	71,521	-10.9	206	47.8	3.1	49.1
Monongalia	55,617	60,797	- 8.5	152	49.0	4.0	47.0
Preston	27,233	31, 399	-13.3	42	9.3	14.2	76.5
Taylor	15,010	18,422	-18.5	88	38,6	7.9	53.5
Total for Region	274,164	307,281	-10.8	92.7	40.1	6.5	53.4
State	1,860,421	2,005,552	- 7.2	77	38.2	6.5	55.3
Nation			+11.7	50.5	69.9	7.5	22.0

Sources: II. S. Census of Population, 1960

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Table 5-C Labor Force 1965

Poddridge	764	708	92.7	
Gilmer	2,360	2,090	9.88	
Harrison	30,382	28, 134	95.6	
Lewis	6,610	060'9	92.1	
Marion	23,210	22,040	95.0	
Monongalia	21,080	19,970	94.7	
Preston	7,590	7,020	92.5	
Taylor	2,094	1,938	95.6	
Region	94,090	87,990	93.5	
State	612,000	563,400	92.2	47,600
Nation	78,357,000	72, 179, 000	95.4	3,456,000

Sources: West Virginia Department of Employment Security; Statistical Abstract of the U. S., 1966

Table 5-P Employment 1965

V-93-WVA

									Tran	Transp. &	Wholesale	ale							Ť		
County	ABL	Agriculture	Mining	Bui	Man	Manufact.	Cons	Construct.	Commun	mun.	Retail Trade	Trade	Fins	Finance	Services	es	Gove	Government	Others	ers	Total
Doddridge	34	4.8%	55	7.8%	163	23.0%	23	3.29	52	10.6%	131	18.59	22	3.10	62	8.8%	10	9.9%	73	10.3%	708
Gilmer	995	8.92	480	23.0	30	1.4	40	1.9	120	5.7	120	5.7	20	1.0	09	2.9	410 19.6	19.6	250	250 12.0	2,090
Harrison	1343	4.8	2115	7.7	6462	23.0	923	3.3	7567	10.5	2815	18.4	859	3.1	2449	8.7	2797	6.6	2862	10.6	28,124
Lewis	760	760 12.5	340	5.6	1220	20.1	80	1.3	999	9.2	810	13.3	0.5	1.4	340	5.6	1230	20.2	099	10.8	060'9
Marion	480	2.2	3160 14.3	14.3	0009	27.2	620	2.8	1770	8.0	3190	14.5	550	2.5	1760	8.0	2240	10.2	2270	10.3	22,040
Monongalia	440	2.2	2080	10.4	2940	14.7	086	6.4	069	3.5	2630	13.2	360	1.8	1650	8.3	5950	29.7	2250	11.3	19,970
Preston	830	830 11.8	1470	6.02	910	13.0	120	1.7	009	8.5	069	8.6	06	12.8	280	4.0	1080	4.0	056	13.5	7,020
Taylor	93	4.7	150	7.7	445	23.0	64	3.3	203	10.5	357	18.4	56	3.0	169	8.7	193	10.0	205	10.6	1,938
Region	4540	5.2	9910	11.3	18170	20.7	2850	3.2	0269	6.7	13110	0.41	2050	2,3	6770	7.7	13970	15.9	0496	10.9	87,980
State	31300	5.6	47800	8.5	128600	22.8	22000	3.9	40600	7.2	83400	14.8	13800	2.4	55600	6.6	8500	14.5	00885	10.4	563,400

Source: West Virginia Department of Employment Security

Region 5

INDUSTRIAL FACILITIES

Small plant == 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Plants	No. of Large Plants	No. of	Total Employment
Heavy Manufacturing	66	4	4	74	7,332
Light Manufacturing	77	7	-	84	2,516
Metals	31	2	2	35	-3,839
Wood & Paper	42	3	-	45	979
Chemical	5	-	-	5	71
Petroleum	4	-	-	4	18
Glass & Pottery	42	9	4	55	10,697
TOTAL	267	25	10	302	25,452

Because symbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

RECREATION

Recreation Resources: The Monongahela River and Lake Lynn provide power booting and water skiing opportunities while the Cheat Gorge challenges even the expert canoeist. There is a good deer herd in Preston and parts of Monongalia, Doddridge, Lewis and Gilmer counties. Small game hunting is reasonably good throughout this region. Segments of the West Fork and Little Kanawha provide some of the region's best fishing.

Regional Recreation Areas: Tygart Reservoir and Lake Lynn are the major existing areas. Authorized for construction are Stonewall Jackson Reservoir and Rowlesburg Reservoir.

State Parks: Tygart with water skiing, swimming, camping and a lodge; Watters Smith, historical; Cedar Creek, & O. Maring and picnicking; Cathedral Park, an outstanding natural area; Mont Chateau with a lodge on Lake Lynn Reservoir. Coopers Rock State Forest provides an excellent canyon scene, hiking, fishing and camping. Private associations provide ten golf courses.

Local Recreation Areas: Playgrounds 44, playfields 17, county or city parks 18, camps 4 and swimming areas 5.

SOCIAL OVERHEAD CAPITAL

Libraries

Region 5 is served by: regional libraries in Doddridge and Lewis Counties, a book express in Gilmer County, one large and two smaller libraries in Harrison County, one medium library in Marion County, two small and one medium library in Monongalia County, two small libraries in Preston County, one small library in Taylor County.

Hospitals

Region 5 is served by ten hospitals with a total bed capacity of 970.

Research Facilities

The four research facilities in this region are: W. Va. University, Coal Research Center - U.S.B.M., Petroleum Research Facility - U.S.B.M., Environmental Health Center - H.E.W.

Colleges

Colleges	Enrollment
West Virginia University	13,214
Salem College	1,144
Clarksburg Branch (Salem College)	467
Glenville State College	1,489
Fairmont State College	2,502

Vocational Technical Schools

The major vocational training schools in Region 5 are located in Harrison, Marion and Monongalia Counties. The other counties have small vocational training programs.

REGION 5

NDUSTRIAL SITES

	INDUSTRIAL SITES		
1.	Price Site	150	Acres
2.	Hoard Site	60	Acres
3.	Gutta Site	140	Acres
4.	Van Vorhis Site	25	Acres
5.	Westover Site	20	Acres
6.	Dorsey Site	150	Acres
7.	Outing Site		Acres
8.	Uffington	75	Acres
9.	White Day Golf Course Site	50	Acres
10.	Round Bottom		acres
11.	Freeman Site	157	Acres
12.	Bretz Site	200	Acres
13.	Kingwood Pike Site		Acres
14.	Sincel Site		Acres
15.	Pattery & Pritchard Site		Acres
16.	Reedsville Site	200	Acres
17.	Powder Mille Site		Acres
	Shaffers Site		Acres
19.	Hauge Site		Acres
20.	Meadowbrook Site		Acres
21.	Bartlett Site	50	Acres
22.	Stuttler Site		Acres
23.	Dawmont Site		Acres
24.	Smithburg Site		Acre
25.	Maier Site		Acre
	Goff Site		Acres
27.			Acres
	Gribble Site		Acres
29.	Jane Lew Site		Acres
	Adler Site		Acres
31.			Acres
32.	Glenville East		Acres
33.	Glenville Site	20	Acres

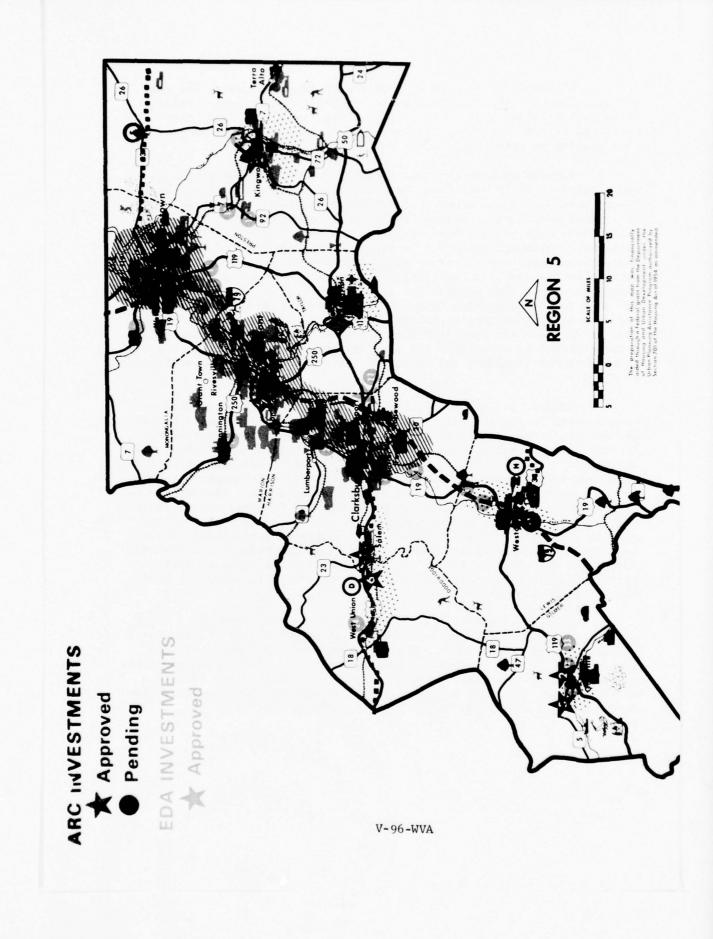
Although the economy in this region is built around the coal mining industry, other industries are growing in importance. Industries such as glass and pottery, construction stone and sand, charcoal, and ceramic clay have all increased in size in recent years, thus placing an even heavier demand on usable water.

Efforts by both the coal mining industry, and the state, in the control of solid materials that are incidental to the mining industry have been quite successful except for surface "runoff" and occasional breakdowns. Streams that once received materials from thirty (30) coal preparation plants are now relatively free from solids pollution. Although pollution by solids in the past was of major importance and received extensive corrective actions a problem that has existed in the past has been greatly magnified in recent years. Acid mine drainage is that problem and is of major concern to West Virginia. Not only does this problem deteriorate the quality of water, but also has very serious aesthetic effects. Efforts to find a feasible solution to this problem have been met with expected success, as far as neutralization is concerned, but the "by-products" of neutralization, such as sludge formation and increased water hardness present additional problems.

Another pollution aspect that has received more attention in recent years is the discharge of raw sewage from municipalities as well as outlying areas. Although there are eleven sewage treatment plants located in this region, some of the major growth areas do not have any treatment. Efforts by the municipalities to acquire facilities in the past have lagged; however, with a closer working relationship with the state, improvements have been made toward having a waste abatement program in effect. It is to be understood that the domestic sewage treatment program is geared to federal aid and certain aspects of this program is slowing down the construction of abatement facilities. Two of the primary causes of this slowdown are: (1) The reduction in federal money; and (2) The inability, at this time, for the State of West Virginia to participate in the additional funds available under the Clean Rivers Restoration Act of 1966.

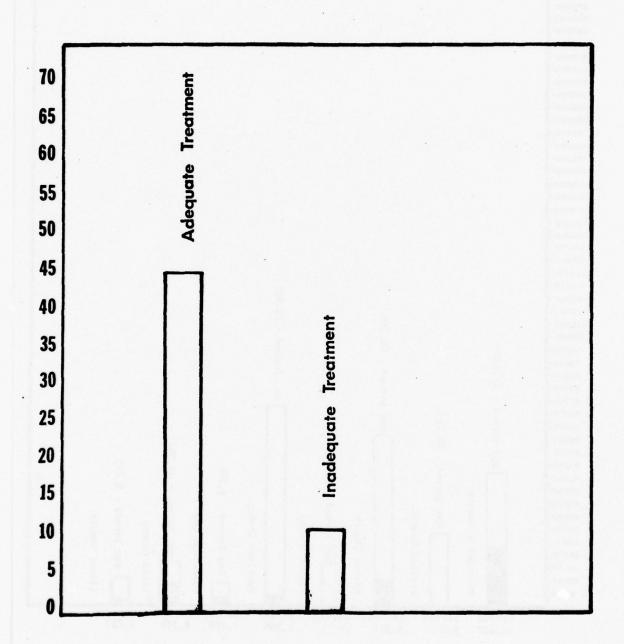
Another activity in this region that is recognized as a major undertaking is the proposed construction of a hydro-electric plant on the Cheat River. This is in conjunction with the Rowlesburg Dam and would employ "pumped storage" in the generating facility. The proposed operation of the structure is being studied carefully since this is a multi-purpose dam to be used for power generation, flood control, flow augmentation with recreation being an incidental benefit.

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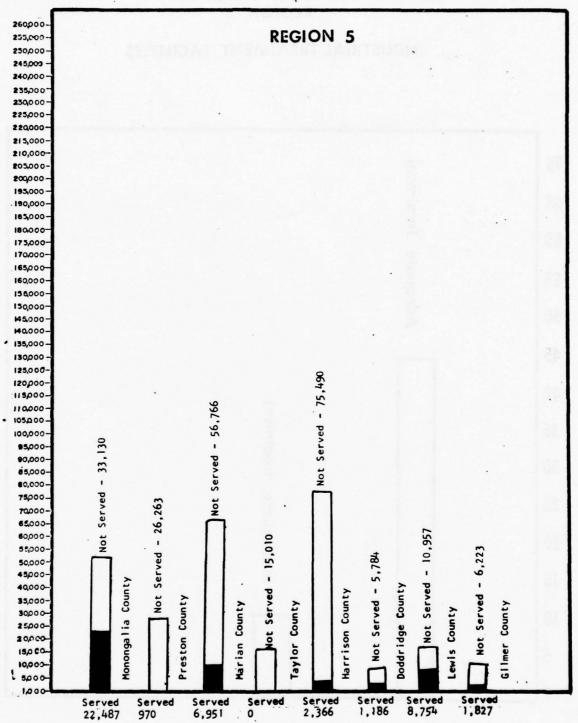


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REGION 5
INDUSTRIAL TREATMENT FACILITIES



MUNICIPAL TREATMENT FACILITIES



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REGION VI

General. Region VI is made up of the eight northeastern counties of Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, Morgan and Pendleton. These eight counties form what is known as West Virginia's Eastern Panhandle and constitute a region which in many respects is unique and distinct from the other eight regions of the State.

Topographically, the region is characterized by broad valleys and rolling countryside interspersed with rugged mountain ridges which traverse it in a general northeasterly-southwesterly direction. It is chiefly the isolating influence of these parallel mountain ridges and the physical remoteness of the Region from the important centers in the northern and western parts of West Virginia which have been responsible for the fact that the Region has more important ties to such centers as Cumberland, Hagerstown and Frederick in Maryland, Winchester in Virginia and to the District of Columbia, than to centers such as Morgantown, Fairmont, Clarksburg and Charleston in West Virginia.

Transportation. Transportation within Region VI and between Region VI and other regions of the state is presently somewhat less than satisfactory. However, with the completion of the Interstate and Appalachian Highway systems this situation will be substantially improved. As we have indicated, it is the rugged topography and general northsouth alignment of mountain ridges within the Region which has historically deterred intraregional and interregional intercourse. With the construction of Appalachian Corridors H and E, intraregional and interregional communication will be vastly improved. In addition, the completion of Interstate Rts. 81, 64, and 77 will greatly improve the time/distance ratio of motor travel between the extreme eastern portion of Region VI and areas in the southern and southwestern parts of the State.

With respect to rail transportation facilities, Region VI is presently served by lines of the Baltimore and Ohio, the Norfolk and Western, the Pennsylvania, and the Western Maryland Railroads. The Baltimore and Ohio crosses the region from east to west and connects the Region with Washington and the eastern seaboard in the east and with Morgantown, Clarksburg, and other points in the west. The Norfolk and Western Railroad passes in a north-south direction through the extreme eastern portion of the Region and connects Charles Town with Hagerstown, Maryland and other points in the South. The Pennsylvania also traverses the eastern portion of the Region in a north-south direction and connects the important regional center of Martinsburg with Hagerstown, Maryland and other points to the north, and Winchester, Virginia to the south. Finally, the Western Maryland parallels almost the entire northern boundary of Region VI via the Potomac River Valley and connects Hagerstown, Maryland with Elkins and other points west.

In the field of air transportation, there is presently existing

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only one commercial airport in Region VI, the Martinsburg Municipal Airport at Martinsburg, in Berkeley County. There are five general aviation airports located near Berkeley Springs in Morgan County, Ridgeley in Mineral County, Keyser in Mineral County, and Petersburg in Grant County.

Population. Considered as a whole, Region VI gained population moderately during the decade between 1950-60. However, as is generally the case, regional averages mask individual differences among counties, and several counties in the region lost population substantially while others gained. The county with the greatest percentage loss was Pendleton County (one of the least populous of the region) with a loss of 13.1%. The county with the greatest population gain was Berkeley County (the region's most populous) at a modest rate (1% over the sixyear period). Pendleton County, it would appear, is continuing to lose population as are the counties of Hampshire, Hardy and Morgan. Those counties which appear to have gained population since 1960 are:
Mineral (4.6%), Berkeley (4.2%), Jefferson (2.3%) and Grant (2.3%).

Berkeley, Jefferson and Mineral Counties were the only ones in Region VI which registered any urban population according to the 1960 census. It is significant to note that these are the counties which are gaining population, while the other counties of the region, those with substantial rural farm and rural non-farm populations, are continuing to be depleted by out-migration. It would seem reasonable to assume that at least some of the population loss of Pendleton, Hampshire, Hardy and Morgan Counties is reflected in increases in the population of the other four counties of the region and, further, that most of the population increase is taking place in urbanized areas in conformance with generally observed patterns elsewhere in the nation.

Employment. The leading employment sectors in Region VI are agriculture, manufacturing, wholesale and retail trade and government. The average rate of unemployment prevailing in the region in 1965 was approximately 8.3%, above the state level of 7.8% and considerably above the national level of 4.6%. Among the counties which comprise the region, the rates of unemployment ranged from lows of 6.8% and 7.2% in Mineral and Morgan Counties to a high of 15.5% in Pendleton County.

Region VI is far ahead of all other regions in the state in terms both of agricultural employment and the marketed value of farm production. In 1964 the marketed value of its farm products amounted to 37% of the total for the entire state. It produces 3/4 of all the fruit and more than 1/3 of all the livestock sold in West Virginia. In conformance with trends observed generally in the state and nation, the number of farms has been declining steadily in Region VI. The highest percentage declines between the agriculture censuses of 1959 and 1964 were in Berkeley and Grant Counties where the number of farms declined 23.9% and 28.5%, respectively. The lowest percentage declines were observed in Pendleton County (16.5%), Jefferson County (16.1%) and

Hampshire County (8.9%). Only in Mineral County, which has the second smallest number of farms of any county in the region (430), was there no significant decline between 1959 and 1964 in the total number of farms in operation.

As the total number of farms in the region has declined, so also has the total value of farm production. Between 1959 and 1964 the value of marketed regional farm productions feel from \$40.3 million to \$37.7 million and from 40% to 37% of the state total. Only in Jefferson County (the leader in the region in terms of marketed value of farm production) and in Mineral County did the value of marketed farm production increase over the period in question.

The principle agricultural products of the region in the order of their importance are crops (especially fruits), poultry and poultry products, and livestock and livestock products.

In the total context of the regional economy, manufacturing is even more important than agriculture, both from the point of view of employment and from the point of view of its contribution to the gross regional product. In 1965, regional manufacturing employment totalled approximately 8,750. This employment was concentrated primarily in Berkeley, Mineral and Jefferson Counties, and mainly in the urban centers of Martinsburg, Keyser, Piedmont and Charleston. Principal manufacturing industries in the region include glass, lumber and woodworking (except furniture), wearing apparel, electronics, and food and kindred products.

According to the 1963 Census of Manufacturers, the value added by regional manufacturing totalled \$97,637,000 in 1963 or approximately 5.3% of the state total. Berkeley and Jefferson County industries with a respective value added of \$71.1 and \$19.6 million accounted for 93% of the regional total in that year.

Income. Compared to the rest of the nation, levels of income, both median family income and per capita disposable income, are low in Region VI. As might be expected, the highest levels are observed in those counties which have the largest concentration of manufacturing employment: Berkeley, Mineral, and Jefferson Counties. Even in these counties, however, 1966 income levels were significantly below those found generally in the nation. In some of the counties of the region, especially those characterized by high rates of unemployment, low levels of manufacturing employment, and high concentrations of employment in agriculture and mining, the levels of income are comparable to those of the most depressed counties of the state. The national average per capita disposable income was \$2,367, in 1966. The per capita disposable income figures for Grant and Pendleton Counties however, were only \$1,059 and \$1,120.

Problems and Potentials. The extreme eastern portion of Region VI

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is predominated by the Martinsburg-Charleston Supplemental Investment area which is the major area of growth potential in the region. The regional overview map at the end of the chapter, illustrates the importance of this center and shows the other SIA's and DIA's in the region.

The topography of Region VI and the resulting transportation difficulties within the region has accounted for the region's slower development rates in the past. The planned highway improvements will drastically change this situation in the near future and the basic nature of the region will also change.

Region VI leads by far the other regions of the State in potential industrial sites. These sites are in ample supply either in or around all the SIA's and DIA's and are an important factor in the region's future.

The region is also blessed with a relatively good supply of water and with proper developments will face no problems in this area. Also, the region is well endowed in recreational and natural resources, particularly in the western section.

It is in the area of community facilities that the region has its most serious deficiencies. Improved vocational education facilities are needed throughout most of the region as are improved facilities. Educational T.V. is needed to complement the overall education program within the region and all efforts should be made to carry it to all parts of the region.

REGION 6

ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Reyed to Overlay Opposite Page)

APPROVED	ARC	INVESTMENTS

		APPROVED ARC INVESTMENTS		
No.	Location	Description	Section	ARC Funds
1	Mertinsburg	Martinsburg Public Library	214	\$ 91,113
2	Ronney	Hampshire County Library	214	\$1,000
3	Keyser	Mineral County Vocational Center	214	235,225
	Pendleton County	Land Conservation Project	203	120,000
	Mineral County	Land Conservation Project	203	50,000
	Grant County	Land Conservation Project	263	105,000
		PENDING ARC INVESTMENTS		
No.	Location	Description	Section	ARC Funds
4	Nampshire	Kinney Shoe Factory Access Road	201	8,750
5	Mineral County	Keyser Industrial Park - 0.90 miles	201	29,750
•	Shepherdstown	Shepherd College Administration and Academic Bldgs.	214	72,118
,	Keyser	Potomac State College Academic Bldg.	214	330,000
•	Martinsburg	Martinsburg City Mospital	214	319,421
		APPROVED EDA INVESTMENTS		
No.	Location	Description		EDA Punds
1	Martinsburg	Martinsburg Veneer Corp. Plant Restroati	on	764,000
	Martinsburg	Martinsburg Voncer Corp.		34,000
2	Pomney	Romney Water System Improvement		150,000
3	Charles Town	Jefferson County Sewage Coll. Survey		20,000
	Charles Town	EDA/Jefferson County-Feasibility of Laying Sewer Line by Rand Process		2,000
4	Keyser	Railroad Spur to Mineral Co. Ind. Park		35,000
5	Keyser	Keyser Waste Treatment Plant		176,000
6	Keyser	Keyser Water Storage Tank/Line		169,000
7	Keyser	Keyser 12" Water Line Extension		240,000
	Keyser	Keyser 12" Water Line		58,000
	Keyser	Keyser Fabric Finishing & Dyeing Plant		650,000
•	Martinsburg	Water and Sewerage Treatment and Distribution System		874,000
10	Charles Town	Saniram Saver System		482,500

Sanitary Sewer System

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276,000

Table 6-A Geography

Counties	Area (Sq. Mi.)	% Area of State	Area in Farms (Sq. Mi.)	9/0	Area Urban- ized (Sq. Mi.)	%	Area Remaining (Sq. Mi.)	97.
Berkeley	316	1.3	181.0	57.3	2.4	. 8	132.6	41.9
Grant	477	2.0	236.6	49,6	1.1	. 2	239.3	50.2
Hampshire	639	2.6	309.3	48.4	1.3	. 2	328.4	51.4
Hardy	585	2.4	311.2	53.2	. 7	. 1	273.1	46.7
Jefferson	211	. 9	159.9	75.8	2.8	1.3	48.3	22.9
Mineral	330	1.4	173.7	52.6	2.6	. 8	153.7	46 6
Morgan	233	1.0	74.1	31.8	.7	. 3	158.2	67.9
Pendleton	695	2.9	453.1	65.2	.4	. 1	241.5	34.7
Totals for Region	3,486	14.5	1,898.9	54.5	12.0	. 3	1,575.1	45.2
State	24,079	100.0	8,248.2	34.3	314.2	1.3	15,516.6	64.4

Sources: U. S. Census of Population 1960; U. S. Census of Agriculture 1964; West Virginia Department of Commerce, Planning and Research Division, "West Virginia Incorporated and Unincorporated Communities."

Table 6-B Population

Counties	Population 1960	Population 1950	% Change 1950-60	Pop. Sq. Mi.	Urban Pop. as % of Total	Rural Farms Pop. as % of Total	Rural Non-Farm Pop. as % of Total
Berkeley	33,791	30,359	11.3	107	44.9	10.1	45.0
Grant	8,304	8,756	- 5.2	17		32.3	67.7
Hampshire	11,705	12,577	- 6.9	18		22.9	77.1
Hardy	9,308	10,032	- 7.2	16		38.0	62.0
Jefferson	18,665	17,184	8.6	89	17.8	10.5	71. 7
Mineral	22,354	22,333	. 1	68	27.7	7.2	65.1
Morgan	8,376	8,276	1.2	36		9.0	91.0
Pendleton	8,093	9,313	-13.1	12		53.2	46.8
Totals for Region	120,596	118,830	+ 1.5	34.6	20.5	17.4	62.1
State	1,860,421	2,005,552	- 7.2	77	38.2	6.5	55.3
Nation			+11.7	50.5	69.9	7.5	22.6

Sources: U. S. Census of Population, 1960

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Table 6-C Labor Force 1965

County	Labor Force	Employment	%	Unemployment	%
Berkeley	13,973	12,932	92.5	1,041	7.5
Grant	4,240	3,890	91.7	350	8.3
Hampshire	3,490	3,130	7.68	360	10.3
Hardy	2,880	2,570	89.2	310	10.8
Jefferson	6,017	5,568	92.5	446	7.5
Mineral	7,166	089,9	93.2	486	8.9
Morgan	2,210	2,050	92.8	160	7.2
Pendleton	2,200	1,860	84.5	340	15.5
Region	42,176	38,680	91.7	3,496	8.3
State	612,000	563,400	92.2	47,600	7.8
Nation	78,357,000	72,179,000	95.4	3,456,000	4.6

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Sources: West Virginia Department of Employment Security; Statistical Abstfact of the U. S., 1966

Table 6-D Employment 1965

County	Agric	Agriculture	Min	Mining	Manu	Manufact.	Construct.	net.	Tran	Transp. & Commun.	Wholesale & Retail Trad	9	Finance		Services	Sa	Government		Others	Total
Berkeley 1468 11.3%	1468	11.3%	175 1.4%	1.4%	3754	3754 29.0%	567 4.4%	4.4%	692	5.4%	1636	12.7%	315	2.4%	1021	7.9%	1866	14.4%	315 2.4% 1021 7.9% 1866 14.4% 1438 11.1% 12,932	12,932
Grant	870	570 14.7	320 8.2	8.2	380	380 9.9	1090 27.9	6.73	120 3.1	3.1	410	10.5	120 3.1	3.1	130	3.3	350	0.6	400 10.3	3,890
Hampshire 1000 31.9	1000	31.9	40	40 1.2	220	220 7.1	20	20 .06	180	5.8	360	11.5	20	90.	180 5.8	5.8	9	19.2	600 19.2 510 16.3	3,130
Hardy	850	33.1	20	1.9	510	510 19,8	25	25 1.0	20	50 1.9	320	12.4	25	1.0	100 4.0	4.0	330	330 12.8	310 12.1	2,570
Jefferson 632 11.4	632	11.4	75 1.3	1.3	1616 29.1	29.1	244 4.4	4.4	297	5.3	704	12.6	135	2.4	439	7.9	808	804 14.4	622 11.2	5,568
Mineral	364	5.4	99	80.	1998 29.9	29.9	363	363 5.4	1408 21.1	21.1	850	12.7	7.1 411	1.7	467	7.0	133	2.1	927 13.9	6,680
Morgan	320	320 15.6	100 4.9	4.9	140	140 6.8	50	50 2.4	180	8.9	240	11.7	50	2.4	300 14.6	14.6	350	350 17.1	320 15.6	2,050
Pendleton	840	45.2	50	2.7	130	6.9	45	45 2.4	40	2.2	180	9.6	15	80.	70 3.8	3.8	290	15.6	290 15.6 200 10.8	1,860
Region	6044	15.6	998	2.3	8748	22.6	2404 6.2	6.2	2967 7.7		4700 12.1	12.1	794	2.1	794 2.1 2707 7.0		4723	12.2	4723 12.2 4727 12.2	38,680
State	31300	31300 5.6 47800 8.5	47800		128600 22.8	1 1	22000 3.9		40600	7.2	83400	40600 7.2 83400 14.8	13800	2.4	55600	6.6	81500	14.5	13800 2.4 55600 9.9 81500 14.5 58800 10.4 563,400	563,400

Source: West Virginia Department of Employment Security

Region 6

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Plants	No. of Large Plants	No. of	Total Employment
Heavy Manufacturing	20	7	1	28	2,482
Light Manufacturing	46	. 4	2	52	3,959
Metals	5	1	-	6	420
Wood & Paper	31	2	-	33	815
Chemical	6	-	-	6	349
Petroleum	5	-	-	5	150
Glass & Pottery	18	6.	-	18	1,106
TOTAL	131	14	3	148	9,281

Because wymbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

SOCIAL OVERHEAD CAPITAL

Libraries

Region 6 is served by: regional libraries serving Grant, Hardy and Mineral Counties and six libraries serving Berkeley, Hampshire, Jefferson, Pendleton and Morgan Counties.

Hospitals

Region 6 is served by seven hospitals with a total bed capacity of 498.

Research Facilities

The two research facilities in this region are:

Allegheny Ballistics Laboratory, E. I. Dupont Explosives Division.

Colleges

Colleges Enrollment
Shepherd College 1,376
Potomac State Jr. College 827

Vocational Technical Schools

Berkeley County has the major vocational training schools in Region 6. The remaining counties have small vocational training programs.

RECREATION

Recreation Resources: The region is characterized by park-like scenic landscapes of mountain and valley views. Mountain forests and wilderness areas backdrop the open valley farms, scenic rivers and historical sites to provide a combination of recreation attractions. The Potomac, South Branch, Cacapon, Opequion and Shantmandoch free flowing streamways are chief assets for small craft floating, canoeing, fishing and swimming. Big and small game hunting is excellent throughout most of the region.

Regional Recreation Areas: Part of George Washington and Monongahela National Forests, including the Spruce Knob-Seneca Rocks National Recreation Area and the Sanoke Hole Gorge. Marpers Ferry National Park, parts of the C40 Canal and the Appalachian Trail. Reservoirs - Stoney River and Vepco (potential reservoirs at Bloomington, Back Creek and Little Cacapon). State Parks - Cacapon and Lost River. Hunting areas - Sleepy Creek, Nathaniel and Short Mountain.

Local Recreation Areas: Playgrounds and playfields 10; county camps 4; county and city parks 4; swimming areas

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INDUSTRIAL SITES AND ACRES

1.	Silvers	20	34.	Fast Canon Bridge	244
2.		190	35.	East Capon Bridge South Augusta .	106
3.	Green Spring #2 Green Spring #1	190	36.	Pleasant Dale	50
4.		183	37.		166
5.	Green Spring #3	114	38.	South Augusta	185
	Green Spring #4			West Hanging Rock	
6.	Wachter	.4	39.	South Hanging Rock	627
7.	Henry	15	40.	Sedan	
8.	Pines Tavern	5	41.	Route 42	50
9.	Clem	8	42.		25
10.	Clem	26	43.		50
11.	Number Two	500	44.		200
12.	Heatherfield	20	45.		200
13.	Number Five	500	46.		100
14.	Van Clevesville	500		Petersburg South	100
15.	Number One	1,000	48.	Upper Tract	790
16.	Number Three	1,000	49.	North Riverton	68
17.	Mittleman	?	50.	South Riverton	71
L8.	Engle	30	51.	Judy Gap	285
19.	Ambrose	80	52.	Route 28	83
20.	Hasson	15	53.	Fort Seybert	90
21.	Nash	20	54.	North Franklin	25
22.	Weller	9	55.	Oak Flat	195
23.	Keyser Ind. Park	200	56.	Oak Flat	235
24.	Vance	38	57.	Franklin	228
25.	North Romney	88	58.	Franklin	300
26.	West Romney	295	59.	Brandywine	414
7.	Romney	71	60.	Oak Flat	230
8.	Romney	75	61.		57
9.	Junction	458	62.		174
ю.	South Romney	540	63.	Route 220	151
1.	Augusta	89	64.	South of Franklin	114
2.	Augusta	291	65.	Marper	92
3.			66.	State Line	52
3.	West Capon Bridge	744	₩.	SCREEN PILIPE	94

Region VI with its characteristic sloping valleys and rolling hills in the past has depended on the agricultural practices to maintain its economy. Although this has been the major economic activity in the past, manufacturing is steadily increasing and agricultural practices are declining. If this trend is to continue, it is probable that an even heavier demand will be placed on the water resources supply in this region.

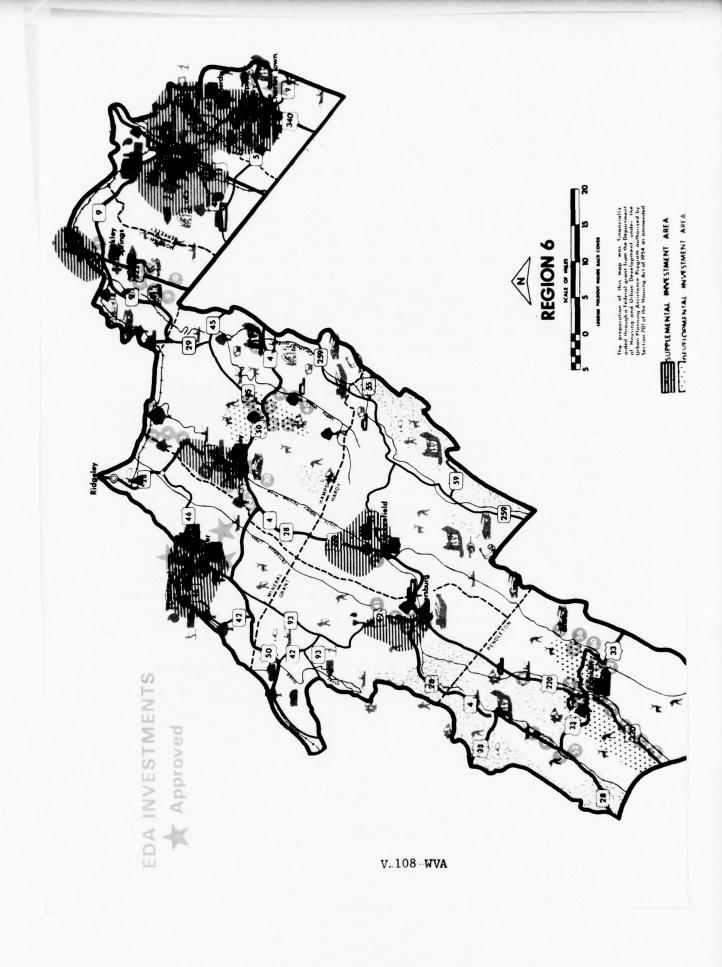
Industry in this region has provided for the treatment and of their wastes, various degress of waste treatment facilities; however, in some areas pollution by industry is a major problem. Mine drainage in this region is located only in a few areas, but the effects of this pollution is quite significant. Due to its close proximity to the nation's Capitol and other large growth areas, Region VI with its characteristic terrain and recreational potential is experiencing an increase in tourist trade which can be expected to grow in the future to a proportional size. This in turn will rely on the properly planned and developed recreational facilities and a subsequent demand for water of high quality.

To insure that this demand for high quality water is met, various programs of pollution abatement have been initiated by the State. New industry which has showed interest in locating in this region has been made aware of existing water quality standards which are in effect on a state level. Municipalities also have been contacted and directed to upgrade existing facilities. Also, in those areas not now providing treatment, the State is pursuing a program of abatement facilities construction.

This area of the State has been acquainted in the last few years with an extensive plan for the development of a national park on the Potomac River. More recently the Potomac River Basin Advisory Committee has been progressing toward the formulation of a commission for the development and management of the basin. At this time, several public hearings have been completed and the committee is continuing its work on the compact. As it is expected, there are both pros and cons to the commission conception; however, it is generally agreed that a commission is the correct approach to river basin management.

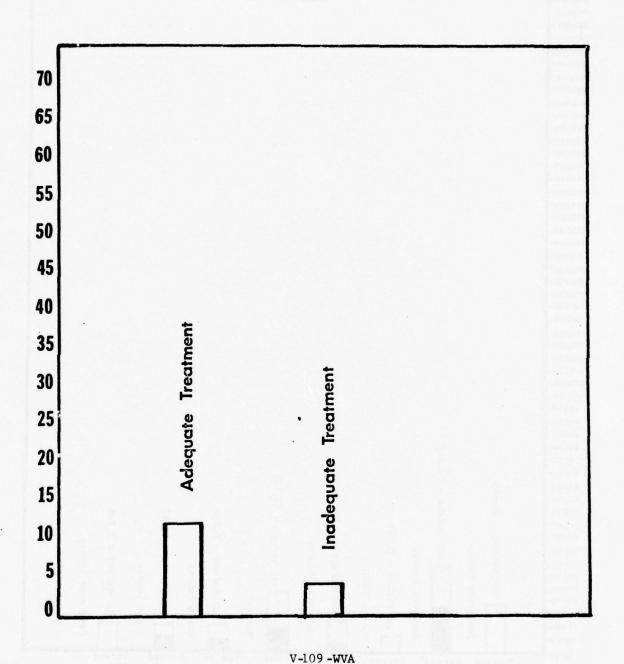
The development of water projects by Corps of Engineers and the Department of Agriculture is continuing and many SCS projects have been completed. Several Corps projects are in various stages of planning and pre-construction.

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REGION 6
INDUSTRIAL TREATMENT FACILITIES



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MUNICIPAL TREATMENT FACILITIES

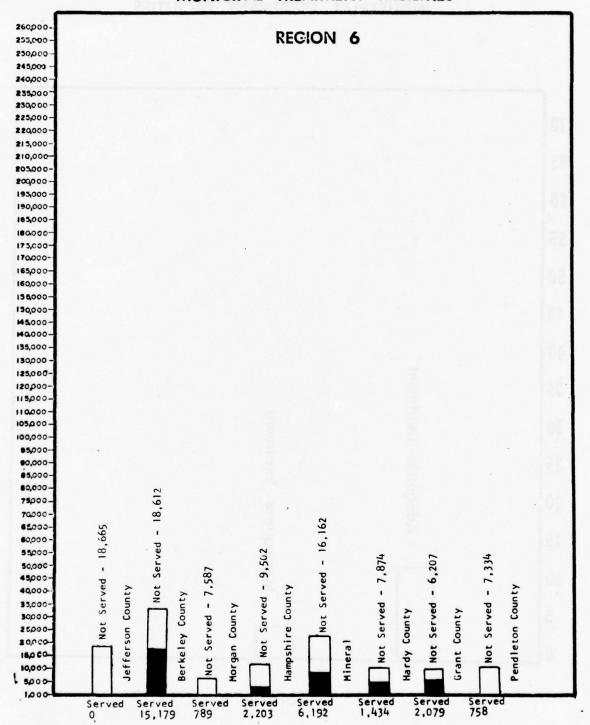


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REGION VII

General. Region VII, composed of the ten counties of Barbour, Braxton, Clay, Greenbrier, Nicholas, Pocahontas, Randolph, Tucker, Upshur, and Webster, is the largest of the State's nine regions and encompasses almost 26% of the total land area of the State. However, well over 1/3 of the land area in the region is taken up by state forests and state recreation areas or is included within the proclamation boundaries of the Monongahela National Forest. This, in addition to the rugged terrain which characterizes most of the region, accounts for the fact that the region has one of the smallest populations and the lowest population density of any of the nine regions within the State.

The topography of Region VII, as has been noted, ranges from hilly to mountainous. The little level land found in the region is located in the valleys of the major streams and in plateau areas atop the higher mountains. The mountainous areas of the eastern portion of the region constitute one of the major watersheds in the eastern United States and serve as the point of origin of several of the State's most important streams, among them the Greenbrier, Cheat, Elk, Tygart and Little Kanawha Rivers. The rugged terrain, the vast wilderness areas, the relatively unspoiled beauty of its streams and forests, and, most importantly, its proximity to population centers to the north, east and west combine to make the region a vast recreation area of great actual importance and even greater potential. Table 7A provides additional information about the geography of the region.

Transportation. Region VII is currently inadequately served by rail and highway transportation facilities, and the resultant inaccessibility and insularity are to no mean estent responsible for retarding the economic growth and development of the region. With the completion of the Interstate and Appalachian highway systems, the situation will be immeasurably improved.

Interstate Rt. 79, which will pass through the west-central portion of the region in the vicinity of Sutton and Gassaway will give this part of the Region greatly improved access to Charleston, Huntington, and other points west as well as improved access to the northern part of the State and the Pittsburgh metropolitan area. Appalachian Corridor H, similarly, will connect the important regional centers of Buckhannon and Elkins with Interstate Rts. 81 and 66 in the east, and Interstate Rt. 79 to the west. This will give the entire northern portion of the region greatly improved access to major north-south and east-west routes and will "unlock" the recreation and natural resource potential of this portion of the region. A corollary of the construction of Appalachian Corridor H will be the closer linking of Region VI and Region VII and the other regions of the state to the south and west.

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Appalachian Corridor L will connect Interstate Rt. 79 to Inter-

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state state Rt. 77 and to the centers of Regions VIII and IX as well as other points further south. Interstate Route 64, already partially completed, will open up the southern portion of Region VII and the important tourist centers of Lewisburg and White Sulphur Springs to developmental influences from the north, from the west, and, most importantly, from the vast urban areas of the eastern seaboard.

One other important highway link is the proposed scenic highway, which will begin in the vicinity of Richwood in Nicholas County and will open up the most scenic and picturesque portions of the eastern highlands and the Greenbrier River Valley to tourism and recreational development. This highway while having neither the status nor the priority of the Interstate and Appalachian highways which lie within the region, will be a valuable asset to the region and will enhance the economic potential of the region's natural recreation resources. However, extreme care must be taken in the routing of this highway so that it does not result in undue destruction to the scenic streams and wilderness areas of the region.

As in the case of highway transportation facilities, Region VII is conspicuously lacking in up-to-date rail transportation facilities and services. Branch lines of three railraods, the Chesapeake and Ohio, the Baltimore and Ohio, and the Western Maryland are located in the region, but they were built originally for the transportation of cut timber and today provide only limited freight service. The extreme southern portion of the region, including the famous resort city of White Sulphur Springs, is serviced by a main line of the Chesapeake and Ohio, which connects it to Washington, D.C. and other important population centers on the eastern seaboard. This same line continues northwestward along the New River and Kanawha River Valleys to Charleston, Huntington, and other points west.

In the field of air transportation, the region is presently served by one commercial airport (the Elkins-Randolph County Airport) and eight general aviation airports (see regional map for their locations). Three new general aviation airports are proposed for the region: at Summersville in Nicholas County; at Lewisburg in Greenbrier County, and at a point near Greenbank in Pocahontas County. Of the presently existing general aviation airports in the region, only one, the Greenbrier Airport at White Sulphur Springs, is paved and has a runway in excess of 3,000 feet.

Population. Every county comprising Region VII lost population between the census of 1950 and that of 1960 (Table 7B). The percentage loss for the entire region was approximately 15.1% and ranged from a high of almost 27% in Tucker County to a low of 4.9% in Upshur County. Estimates of the 1966 population indicate that the region and nine of the ten counties which comprise it are continuing to lose population at a rate almost as great as that which prevailed during the decade 1950-60. In the six-year period between 1960 and 1966, the total regional

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loss is estimated at 6.5%. The estimated individual county losses range from a high of 12.1% in Clay County to a low of 0.2% in Randolph County. Only one county, Upshur, is estimated to have experienced a small population gain during the period.

Only four counties of the ten which comprise Region VII (Greenbrier, Nicholas, Randolph, and Upshur) had any measurable urban population at the time of the 1960 Census. It is, therefore, significant to note that these four counties lost population to a lesser extent than any of the other six counties in the region; and, moreover, that with only one exception, the rate at which they lost population varied inversely with the degree of urbanization of their population. Interestingly enough, the only county to gain population between 1960 and 1966 (Upshur) was also the county with the greatest percentage of population in the urban category. The county which lost the least during the same period (Randolph) had the second highest percentage of population in the urban category.

These observations do not provide <u>prima facie</u> evidence of a trend toward urbanization in Region VII; but they do indicate, however, that the economic opportunities which attract and hold people to a particular area are more likely to be generated in areas of population concentration than in areas of widely dispersed population whose historic economic bases (agriculture, mining, etc.) are no longer capable of perpetuating traditional and increasingly anachronistic modes of population settlement.

Employment and Economic Activity. Available employment figures for the year 1965 indicate that employment in Region VII is concentrated in agriculture (14.5% vs. 5.6% in the State); mining (12.09% vs. 8.5% in the State), and manufacturing (14.2% vs. 22.8% in the State). As one might expect, there are wide variations among the regions with regard to any given employment sector. Thus, Braxton County has 31% of its total employment concentrated in agriculture while Nicholas County has only 6.6% in this sector; Nicholas County has 38% of its total employment concentrated in mining while Braxton has only 2.4% in this sector; and Tucker County has 30% of its employment concentrated in manufacturing while Barbour County has only 5.6% of its employment in this activity.

Unemployment rates vary in a similar manner among the ten counties comprising Region VII. The regional average rate of unemployment in 1965 was 11% as compared to 7.8% in the State and 4.6% in the nation. Among the counties comprising the region, the range was from highs of 19.7% and 19.5% in Webster and Clay Counties to 7.8% and 6.3% in Nicholas and Barbour Counties (Tables 7C and 7D). It is not surprising, therefore, that Webster and Clay Counties were among those counties in the region which exhibited the greatest percentage losses of population in the decade 1950-60 and that they appear to have led all others in population losses during the period 1960-66.

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The number of farms in Region VII has been declining steadily over the two census periods covering the decade 1954-64. Between 1954 and 1964, the number had fallen from 13,567 to 6,833 and the total farm acreage from 1,517,000 acres to 1,080,000 acres. The value of marketed farm products has also been declining in the region and decreased from \$14,773,000 in 1959 to \$13,483,000 in 1964. Farming, nevertheless, remains a relatively important activity in the regional economy and in 1964, the value of marketed regional farm production constituted about 15% of the total for the State. In terms of value of farm products sold, the leading counties of the region were: Greenbrier (\$5,062,000); Pocahontas (\$1,737,000); Randolph (\$1,539,000); Barbour (\$1,303,000), and Upshur (\$1,292,000). Principal products were livestock and livestock products, poultry and poultry products, and dairy products.

Mining activity ranks third in importance in Region VII from the point of view of total employment and greatly exceeds agriculture in the value of marketed production. Coal and stone are the principal minerals mined in the region and Nicholas, Barbour, Greenbrier and Webster Counties are the leading counties in terms of mining employment and value of marketed production is not available for Braxton, Randolph, Tucker and Upshur Counties. Excluding these counties, the value of marketed regional mineral production (chiefly coal) amounted to \$63,085,734 in 1965.

Manufacturing activity is the second largest employer in Region VII and is concentrated primarily in the larger towns: Elkins in Randolph County; Alderson, Ronceverte, Lewisburg, and White Sulphur Springs in Greenbrier County; Summersville and Richwood in Nicholas County; Marlinton in Pocahontas County; Buckhannon in Upshur County; and Philippi and Belington in Barbour County. Production of lumber and other wood products, production of textiles, wearing apparel and other finished fabric products, and production of leather and leather products are the principal elements of manufacturing activity in the region. Value added by manufacturing in the region amounted to \$21,972,000 in 1963.

Income. Levels of income, both median family income and per capita disposable income, are extremely low in Region VII, even when measured against West Virginia standards alone. However, comparison of these figures to national averages point up even further the disparity between the standard of living of the typical resident of "Appalachia" and that of the great majority of Americans. In no county in Region VII does per capita disposable income equal to the national figure of \$2,367 for 1966; and, moreover, in six of the counties the level is more than \$1,000 (42%) below the national figure. Figures for median family income reflect a similar disparity. In every county of Region VII, median family incomes are lower than the median of any county in Region IX, and all but two of the counties of Region VIII. This places Region VII squarely in the ranks of the most economically depressed areas in the State.

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Problems and Potential. Region VII is similar to Region VI in that it has had very inadequate access in the past. In the Supplemental and Developmental Investment areas, this situation will be significantly improved by the planned Interstate and Appalachian Highway developments. Corridor H will link the Elkins, Buckhannon and Philippi SIA's in the northern part of the region with Interstate 79 in the west and Interstate 81 and 66 in the east. In the south, Interstate 64 will bisect the Lewisburg-Ronceverte-White Sulphur Springs SIA and tie this area to the eastern seaboard to southern West Virginia.

The Sutton-Gassaway DIA will be bisected by the north-south Interstate 79 and will thus have ready access to Charleston and to Northern West Virginia. Appalachia Corridor L will tie the Summersville DIA to both I-79 and I-64, as well as to provide better access to the area's hinterlands.

These tremendous improvements in the region's access, along with a generally adequate supply of potential industrial sites and other developable land provides the region with major development potential. The region has a generous labor supply which, if it can be mobilized and trained, will be a major factor in attracting industry into the region.

To mobilize and train this potential labor force the SIA's and DIA's of Region VI must be upgraded with technical education facilities to meet the needs of potential industry. The southern part of Region VI is also in the need of additional higher education facilities. Plans for educational T.V. to complement the basic education program of the region should be accelerated so that the region's young people do not continue to lose out on this opportunity.

Region VII's greatest asset is its superb natural resource base and the proper management of this important economic factor must be given due consideration in development planning. The regional overview map at the end of this chapter vividly illustrates the major forest and recreational resources of the region and their predominant role in the regional economy.

In planning for the development of Region VII, emphasis should be given to preserving major wilderness and scenic areas. Recreational and service developments should be clustered in or near the growth areas whenever possible to guarantee the greatest benefits.

While Region VI has been richly endowed with water resources in the past, efforts must be made to manage this resource if the region is to continue to enjoy the benefits of this abundant resource. A typical example of this problem is the Greenbrier River in the eastern portion of the region. This river currently has no major control facilities and serious flooding was experienced along its banks during the past spring. However, at the same time the river's flow drops extremely

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low in the summer and additional flow will be needed if significant developments are to occur in the Lewisburg-Ronceverte-White Sulphur SIA and the Marlinton DIA. Any such water resource developments must take into consideration the importance of the Greenbrier River as a scenic river and should be aimed also at impriving this quality of the river.

The forest resources of Region VII provides it with tremendous potential as a wood products center for the east coast. However, such developments will require a major mobilization of capital and a significant upgrading of the labor force.

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REGION VII ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Keyed to Overlay Opposite Page)

APPROVED ARC INVESTMENTS

		APPROVED ARC INVESTMENTS		
No.	Location	Description	Section	ARC Funds
1	Nicholas County	Long Point Recreation Area Access Road - 1.80 miles	201	\$ 126,000
2	Greenbrier County	y Sherwood Lake Access Road 10,60 miles	201	227 500
3	Buckhannon	Tri-County Vocational School	201	227,500
	Buckhannon	Tri-County Vocational School	214	250,000
4	Philippi	Alderson-Broaddus College Science Center	214	150,000 234,000
5	Buckhannon	W. Va. Wesleyan College Science Center - Overrun	214	250,612
	Buckhannon	W. Va. Wesleyan College Science Center - Overrun	214	1/5 000
6	Summersville	Summersville Nursing Home	214	165,000
7	Fairlea	Greenbrier County Nursing Home		190,000
8	Maxwelton	Greenbrier County Airport	214	200,000
9	Sutton		214	385,800
		Braxton County Airport	214	57,060
10	Sutton	Braxton County Airport - Overrun	214	19,440
10	Elkins	Randolph County Public Library	214	29,105
11		Greenbrier County Vocational Schools	214	425,403
	Barbour County	Land Conservation Project	203	97,000
	Braxton County	Land Conservation Project	203	
		PENDING ARC INVESTMENTS		
No.	Location	Description	Section	ARC Funds
12	Philippi	Alderson-Broaddus College Phys. Ed. Building	214	175,000
		rnys, Ed. Building		
	***************************************	ADDOUGN CO. INVESTMENT		
Na		APPROVED EDA INVESTMENTS		
No. 1	Location	Description		EDA Funds
	Philippi	Water System Improvement		66,000
2	Frametown	Sugar Creek Water System	25 63	326,000
3	Gassaway	W. Va. Forest Products Particle Board Plant		368,000
	Gassaway	W. Va. Forest Products Co. Particle Board Plant	State of the state	22,000
4	Maxwelton	Greenbrier County Airport Terminal Bldg.	7.00	166,00
5	Summersville	Summersville Convalescent Hospital	Committee The	700,000
6	Summersville	Summersville Water Storage Tank/Line	Part Part	27,000
7	Bartow	W. Va. Dept. Natural Resources Embankment Dam	Ex2	101,000
8	Cass	W. Va. Dept. Natural Resources Scenic Railroad-Tourism	-	227,000
9	Elkins	Memorial General Hospital Assoc.	A Complete	500,000
10	Elkins	Elkins Water System Improvement	2	458,000
11	Tucker County	W. Va. Dept. Natural Resources Canaan Valley-Tourism	Part Com	2,213,000
	Tucker County	Walter Butler Co Canaan Valley Overrun	33 03	3,000
12	Buckhannon	Buckhannon Water Treatment Plant		151,000
13	Webster Springs	Webster County Operations Assistance	Carry San	22,000
14	Elkins	Elkins Sewage System Improvement	C10 C/6	
15		Cowen Water/Sewer System Extension	23, 3%	238,000
			and the same	1,040,000
16	Summersville	Summersville Water/Sewer Facility	We also	58,500
17	Lewisburg	Lewisburg Water System Improvement		145,500
18	Davis	Sewage System		214,000

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	Area	S Area	Ares to Farme		Area Urben-		Remelatag		
Counties	(Sq. Mt.)	of State	(Sq. Mt.)	*	12ed (Sq. Mt.)	*	(Sq. MI.)	*	•
Barbour	336	1.4	176.0	52.6	3.9	1.2	155.3	1.94	
Braxton	517	2.1	149.5	28.9	3.4	۲.	364.1	10.4	
Clay	342	1.4	\$7.4	16.8	5.	=	284.1	63. 1	
Greenbrier	1,026	6.4	358.0	34.9	0.9	٠	662.0	64. 5	
Nicholas	649	1.1	108.4	16.7	2.9	*	537.7	82.9	
Pocehontae	943	3.9	276.3	29.3	3.1	•	663.6	4.07	
Kandolph	1,036	7	252.8	24.4	4.6	•	778.6	15.2	
Tucker	421	1.7	4.4	12.4	1.9	•	324.7	17.1	
Upehur	152	1.9	164.0	46.6	1.1	:	186.7	53.0	
Webster	188	2.3	51.2	9.3	1.0		498.8	\$.04	-
Totals for Region	6,173	25. ¢	1,688.8	27.4	28.6	*:	. 5 4.455.6	12.1	-
State	24.079	100.0	8,248.2	34.3	314.2	-	1.3 15,516.6	4.49	_

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Sources: U. S. Census of Population 1960; U. S. Census of Agriculture 1964; West Virginia Department of Commerces, Planning and Research Division, "West Virginia Incorporated Communities."

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Counties	Population 1960	Population 1950	% Change 1950-60	Ė	Urbas Pop.	Raral Parm Pop. as S. of Total	Rural Nea-Farm Pop. as % of Total
Barbour	15, 474	19, 765	-21.6	:	:	15.5	2.3
Braxton	15, 152	18,082	-16.2	62	:	22.6	17.4
Clay	11,942	14, 961	-20.2	st	••	5.4	\$.06
Greenbrier	34, 446	39, 295	-12.3	M	1.0	12. 9	79.3
Nicholas	25, 414	27,696	- 0.2	61	16.2	9.6	74.0
Pocahontas	10, 136	12,480	-10.0	11		6.75	12.1
Rendolph	26, 349	30, 556	-13.0	\$2	31.5	11.4	1.72
Tucker	7,750	10,600	6.92-	9.1		1.11	6.29
Upshur	18, 292	19.242	6.4.	25	34.9	13.3	91.6
Webster	11, 719	17, 888	-23.3	52	:	8.5	\$11.5
Totals for Region	178,674	210,947	-15.1	28.9	12.0	13.7	74.3
State	1, 860, 421	2, 009, 552	. 7.2	11	38.2	6.9	55.3
Netton			+11.7	\$. 9	6.69	1.5	22.6

Table 7-C Labor Force 1965

Braxton 4,000 3,370 Clay 1,900 1,530 Greenbrier 9,467 8,478 Nicholas 7,270 6,700 Pocahontas 3,250 2,930 Randolph 8,890 7,870 Tucker 2,240 2,030 Upshur 5,070 4,630 Webster 2,840 2,280 Region 48,727 43,388 State 612,000 563,400 State 612,000 563,400	3,570 93.7	240	6.3
1, 900 rier 9, 467 7, 270 ph 8, 880 2, 240 2, 240 5, 070 1, 2, 840 48, 227 48, 227 612, 000	84.3	630	15, 75
9,467 7,270 3,250 8,880 2,240 2,240 5,070 48,727 612,000	80.5	370	19.5
77, 270 8, 880 2, 240 5, 070 5, 070 1, 84, 227 48, 727 612, 000	9.6	686	10.4
3.250 8.880 2.240 5.070 5.070 48.727 612.000	92.2	570	اب د
8, 880 2, 240 5, 070 2, 840 48, 727 612, 000	90.2	320	8 6
2.240 5.070 5.070 48.727 6.12,000	9.88	1,010	+ 11
5,070 2,840 48,727 612,000	9.06	210	4.0
48,727	91.3	440	8.7
612,000	80.3	999	19.7
612,000	89.0	5, 339	11.0
70 357 000	92.2	47,600	7.8
_	4.59	3,456,000	4.6

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urces. West Virginia Pepartment of Employment Security; Statistical Abstract of the U. S., 1966

able 7-D Employment 1965

County	Agric	Agriculture	Mining		Manufact.	act.	Construct.	ict.	Transp. Commun	. u	Wholesale A Retail Trade	rarie France	Tinance		Services	8	Cove	Government	Others	ø.	Total
Barbour	630	17.6%	800 22.	22. 4%	200	5.6%	70 2	2,04	150	4, 2%	370	10, 40	20	1.40	440	12.3%	420	11.85	440 12.3	2.3	3,570
Braxton	1040	30.9	80 2.	2.4	250	7.4	2 06	2.7	270	8.0	380	11.3	3.0	0	230	8.8	950	15.4	480	14, 2	3, 370
Clay	270	17.6	110 7.	7.2	210	13.7	N.A.		N.A.		0.6	5 9	N. A.		7.0	9.4	200	32.7	220	+ +	1,470
Greenbrier	1476	17.4	472 5.	5.6	839	5.6	397 4	+.7	472	5.5	1228	14.5	157	1.8	1116	13, 2	996	11.4	1355	11.0	8.478
Nicholas	0++	6.6	2550 38.0	0.	700	10.5	230 3	3, 4	210	3.1	710	10.6	80	1 2	062	4.3	730	10.9	760	15.4	4,700
Pocahontas	530	18.1	N.A.		640	21.8	1 0+	F. 4	100	3.4	240	8 2	N.A.		350	11.9	240	20.2	370	12.6	2,860
Randolph	640	8.1	570 7.	7.2	1610	20.5	440 5	5.6	099	**	1160	- * 1	200	2.6	710	0.0	096	12.2	920	11.7	7.870
Tucker	270	13.3	N.A.		009	29.6	N. A.		06	7.7	260	12.3	N.		0+1	6.9	980	17.3	210	10.3	0.8.0
(Tpshur	689	14.6	280 6.	6.1	800	17.3	130 2	2,8	290	6.3	800	17.3	8.0	1.7	460	6.6	110	9.5	0.2.	14.5	4.1.30
Webster	310	310 13.4	250 11.0	0.	330	14. 5	N. A.		200	oc	260	F 11	N. A		110	œ ÷	400	21.5	3710	2 2	2,250
Region	6286	14.5	5112 12.0	H	6119	14. 2	1397 3	3.4	2492	5.7	5488	12.4	205	1.4	3916	6.0	5966	13.8	5725	13.2	43, 108
State	31300	31300 5.6	47800 8.5		128600	22,8	22000 3	3, 4	00901	7.2	83.400	14 8	3800	+ 7	55.00	5	81500 11.5	11.5	588-00	10.4	54.3,400

ree. West Virginia Department of Employment Security

Region 7

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Plants	No. of Large Plants	No. of	Total Employment
Heavy Manufacturing	22	10	-	32	1,530
Light Manufacturing	57	5	-	62	1,880
Metals	3	1	-	4	155
Wood & Paper	118	3	-	121	3,352
Chemical	4	2	-	6	244
Petroleum	6	1	-	7	142
Glass & Pottery	16	. 1	-	17	411
TOTAL	226	23	-	249	7,714

Because symbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

SOCIAL OVERHEAD CAPITAL

Libraries

Region 7 is served by fifteen libraries in Barbour, Braxton, Clay, Greenbrier, Nicholas, Pecahontus, Randolph and Tucker Counties. Upshur County is served by a regional library. Webster County is served by a book express.

Hospitals

Region 7 is served by thirteen hospitals with a total bed capacity of 811.

Research Facilities

The one research facility in this region is: National Radio Observatory.

Colleges	
Colleges	Enrollment
Alderson-Broaddus College	735
Davis & Elkins College	736
Greenbrier College	162
W. Va. Wesleyan College	1,665

Vocational Technical Schools

The major vocational training schools in Region 7 are located in Nicholas and Randolph Counties. The remaining counties have small vocational training programs.

RECREATION

Recretion Resources: Scenic mountains and valleys; natural and wild river segments - Elk, Shavers Fork, Greenbrier, Gauley, Cranberry and Blackwater, fishing and float streams; wildlife - bear, deer, turkey and small game; fishing - trout, bass, pike and muskie. This region contains a combination of developed sites, natural areas and wilderness areas.

Regional Recreation Areas: Monongahela National Forest, Summersville and Sutton Reservoirs (Rowlesburg authorized); State Parks - Blackwater Falls, Watoga, Holly River, Audra, Carnifax, Droop Mountain, Canaan Valley; State Forests - Kumbrabow, Seneca and Greenbrier; State hunting areas - Williams River, Elk River, Pleasants Creek, Horner Retuge; fishing areas - Teter Creek.

Local Recreation Areas: Playgrounds 10; playfields 22; county or city parks 7; county camps 6; swimming areas 4.

INDUSTRIAL SITES AND ACRES

1.	Midland	100	25.	Belt. & Ohio RP	12
2.	St. George	130	26.	Forrest Products	12
3.	Pleasant Run	110	27.	Dr. Fisher	100
4.	VFW	18	28.	Gassaway	13
5.	Davis	1,000	29.	Les Williams	1.
6.	Thomas	552	30.	Sutton Dan	20
7.	Cartright	50	31.	Burnsville	10
8.	Hall	195	32.		33
9.	Gaston	415	33.	Clay	30
10.	Gaston	200	34.	Muddlety	30
11.	White	175	35.	Craigaville	20
12.	Yeager	15	36.	Airport	10
13.	Belington Ind. Pa		37 .	Intersection	40
14.	Thacker	40	38.	Summersville	15
15.	Schmidlen	60	39.	Paper Will	10
16.	Stock Yard	50	40.	Marlinton	26
17.	Frazee	56	41.	Hillsboro	22
18.		10	42.	Board	
19.	Headows	284	43.	Rupert	_
20.	Simmons	112	44.	Rainelle	30
21.	Kittle	50	45.	White Sulphur	34
22.	Gear	60	44.	Caldwell	25
23.	Rosery	- 40	47.	Ronceverte	13
24	West Burneville	20			

V-120-WVA

This region, which comprises 26% of the total land area in the state, is primarily characterized by mountainous, hilly terrain with a sparse population, and has well over 30% of the land taken up by state forests and state recreational areas. It is also included within the boundaries of the Monongahela National Forest. The eastern reaches of the region comprises one of the major watersheds in the eastern United States and serves as the headwaters of the Greenbrier, Cheat, Elk, Tygart and Little Kanawha Rivers. The mountainous terrain with its relatively unspoiled streams is a vast recreational area with significant importance. Two federal lakes located in this region offer broad water recreation and flood control, although there are problems from time to time when drawdown is performed during recreation periods; however, the overall benefits gained are great. Future development of lakes in this region is needed primarily for flood control and flow equalization; however, the location, size and operation of these lakes should be carefully planned and developed to maximize aesthetics and recreational potential of this area which is unsurpassed by any state east of the Mississippi River.

Pollution Control. Pollution control primarily in this region is aimed at municipalities and manufacturing. Although there are only a few municipalities located in this region, the lack of waste treatment facilities is evident. If these municipalities in the future are to serve as service areas to recreational areas waste abatement programs must be adopted and carried out to provide maximum benefits.

Industry in this region has made considerable progress in waste abatement, in effect, although some problems are still evident in this area. The leather industry, for example, is experiencing trouble in successfully treating its waste. In approaching this problem, a research project has been put in action by the state in cooperation with the tanning industry, the tanners, and with funding from a federal water pollution control administration grant to find a feasible solution to this problem.

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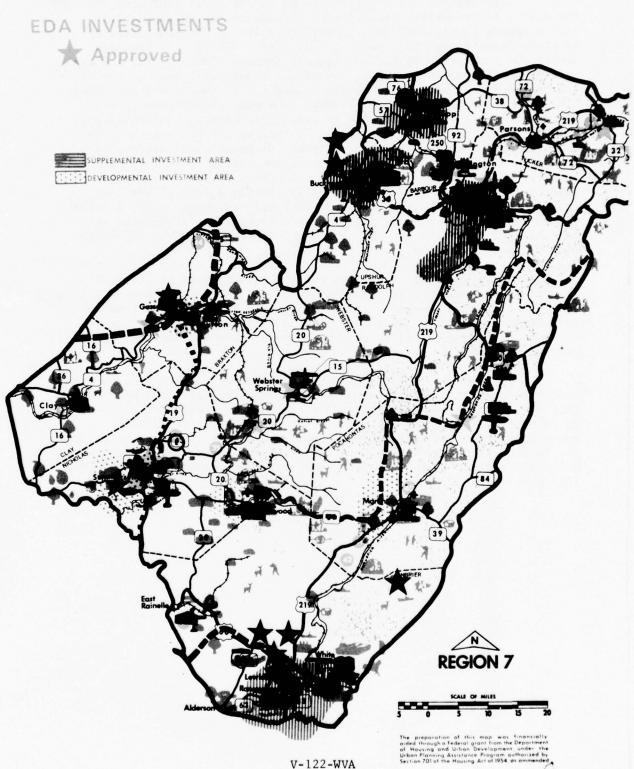


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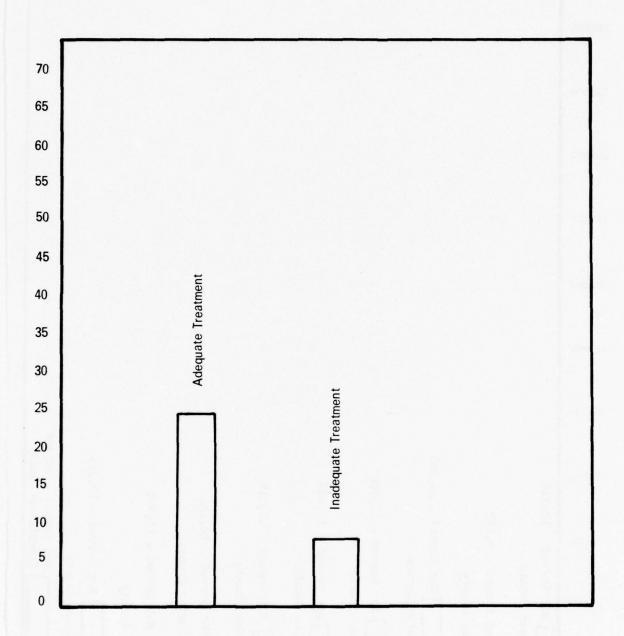
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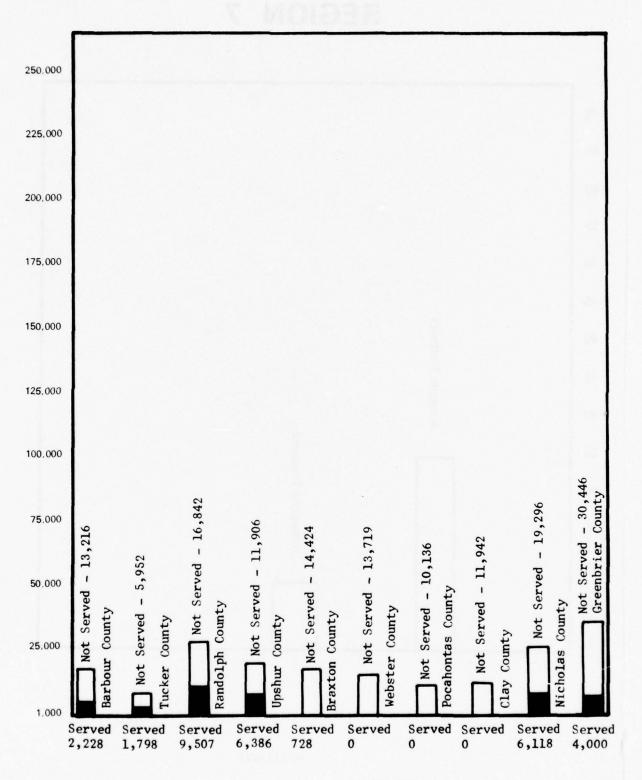
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INDUSTRIAL TREATMENT FACILITIES REGION 7



MUNICIPAL TREATMENT FACILITIES REGION 7



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REGION VIII

General. Region VIII is composed of the five southern counties of Fayette, Mercer, Monroe, Raleigh and Summers. It exhibits many of the features which one generally associates with "Appalachia", including, among others: high levels of unemployment; concentration of employment in industries whose importance, from the point of employment is declining nationally; low levels of personal and family income; low labor force participation rates (particularly among women); and relative insularity and inaccessability, etc.

The topography of the region is extremely rugged and there is little level, developable land, except for plateau areas located on mountain tops. Elevations range up to more than 4,000 feet in the region and a considerable portion of the region is characterized by slopes between 25 and 40 percent. The New River and the Bluestone River are the dominant water courses in the region, and a large flood control-recreation reservoir exists at the junction point of the two rivers. The reservoir lies principally in Summers County, but also influences the neighboring counties of Mercer and Monroe in West Virginia and Giles County in Virginia. The New River Valley from Hinton northward to Gauley Bridge is one of the principal corridors for rail traffic between the industrial centers of Regions I and II, and the major population centers of the eastern seaboard. Table 8A provides additional information about the geography of the region.

Transportation. Existing rail transportation facilities in Region VIII are relatively good. The main east-west line of the Chesapeake and Ohio at Hinton in Summers County and the other at Fayetteville in Fayette County.

Population. The population of Region VIII and of every county which comprises it has been decreasing steadily and rather substantially for several years. For the region as a whole, the population loss between the 1950 and 1960 censuses was on the order of 17.9% (Table 8B). The losses ranged from a low of 9.1% in Mercer County to a high of 25.1% in Fayette County. Moreover, on the basis of population estimates for 1966, it would appear that the region is continuing to lose population. The estimated loss for the region over the six-year period from 1960-66 amounts to 9.8%.

In 1960, over 68 percent of the population of Region VIII was classified as rural non-farm. In the State, only Region VII and Region IX had higher proportions of rural non-farm population. Only Mercer County, with 40.5% of its population classified as urban, came close to the national figure for urban population (69.6%), while Monroe County had virtually no urban population whatsoever. It is significant to note that Mercer County also had the lowest population loss from 1960-66. In the same year, rural farm population represented a significant percentage of total population in only two counties in the region: Monroe (36.7%) and Summers (13.6%).

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Employment and Economic Activity. Employment figures available for the year 1865 indicate that employment in Region VIII is concentrated in mining (12.7%), manufacturing (12.0%), wholesale & retail trade (18.7%), services (11.1%), and government (13.3%). Rates of unemployment varied significantly from county to county in the region, though in every county the rate was higher than that for the State and much higher than that prevailing in the nation. Fayette County led in unemployment with a rate of 13.2%, while Mercer County had the lowest rate in the region with 8.3% (Tables 8C and 8D).

Agriculture as a source of employment is of slight importance in Region VIII but is of significance in Summers and Monroe Counties. Between 1954 and 1959, the number of farms declined between 30% in every county of the region except Monroe, where the decline was on the order of 20%. Between 1959 and 1964, the number continued to decline averaging in the neighborhood of 20% for the region as a whole. Total farm acreage in the region declined over 16% between 1959 and 1964, while the value of farm products sold (livestock and livestock products, poultry and poultry products, and dairy products) amounted to \$6.8 million.

Mining has long been an important economic activity in the region and in 1965 employed significant numbers in both Fayette and Raleigh Counties. The value of marketed coal production amounted to almost \$28,000,000 in Fayette County in 1965, while data relating to the value of marketed coal production in Raleigh and Mercer Counties was withheld to avoid disclosure of confidential information relating to the operation of individual firms.

Manufacturing is of less importance as an employer in Region VIII than it is in either the State or the nation. However, manufacturing employment is showing signs of increasing in the region. In 1965, Raleigh, Fayette and Mercer Counties had the greatest employment in manufacturing of the five counties comprising Region VIII. Employment was concentrated in light manufacturing, heavy manufacturing, and metals, in order. Value added by manufacturing totalled \$22.5 million in the region in 1963, which represents an increase of 18.4% over a period of five years.

Income. Recent figures relating to median family income and per capita disposable income indicate that Region VIII ranks considerably below national averages and below the levels observed in the more heavily industrialized counties of the other regions of the State (e.g. Regions I, II, IV, etc.). Even within Region VIII there are differences, however, and as one would expect, it is in the more highly industrialized counties - Fayette, Raleigh and Mercer - that one observes the highest level of income. With respect to income levels, as in many other respects, the counties of Region VIII exhibit strong similarities to the counties comprising Region IX, its neighbor to the west.

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<u>Problems</u> and <u>Potential</u>. Region VIII, which is composed of the eastern portion of the southern coal tier counties, has in the past experienced significant economic problems. The region has experienced a tremendous comback from the depressed period of the 1950's and has potential to make even greater studies toward improving its economic base.

In the extreme north, the region is served by the Kanawha Valley Supplemental Investment area. The central portion of the region is served by the Beckley SIA while the southern portion is served by the Bluefield-Princeton SIA. Developmental Investment Areas in the region are Mount Hope-Oak Hill and Hinton.

Access within the region and to outlying markets will be greatly improved with the completion of the major highway developments currently underway. The Bluefield-Princeton SIA will be tied to both the north and south by Interstate 77 and to the east and west by Appalachian Corridor Q. The Beckley SIA will be tied to the north by I-77-64, and Appalachian Corridor L, and to the eastern seaboard by Interstate 64. I-64 will also significantly improve access to the Hinton DIA as will Corridor L provide excellent access to the Oak Hill-Mount Hope DIA.

Region VIII has made tremendous strides in recent years to attract manufacturing and thus broaden its economic base. These efforts must be continued and must include efforts to upgrade the labor force as an incentive to potential manufacturers. A strong vocational educational program is needed throughout the region if it is going to be able to retain its young people as a viable part of its labor force.

The upgrading of the vocational education program should be combined with overall improvements to the basic education system and the establishment of modern techniques such as educational T.V. Additional library facilities are needed in the two Developmental Investment Areas.

As in the other regions of West Virginia, significant improvements to the housing stock and the community environment are priority needs in many parts of the region.

While the regional topography is extremely rugged as a whole, there are significant areas of developable land as illustrated by the industrial site overlay to the regional overview map at the end of the chapter.

REGION VIII

ARC AND EDA INVESTMENTS THROUGH JUNE 30, 1967 (Number Keyed to Overlay Opposite Page)

APPROVED ARC INVESTMENTS

	Location	Description	Section	ARC Funds
1	Raleigh County	Grandview State Park Access Road 2.70 miles	201	\$ 189,000
2	Bluefield	Bluefield State College Technical Science Hall	214	347,386
3	Minton	Summers County Mospital	214	380,521
	Hinton	Summers County Mospital Overrun	214	120,000
	Summers County	Land Conservation Project	203	60,000
	Monroe County	Land Conservation Project	203	104,000
		PENDING ARC INVESTMENTS		
	Location	Description	Section	ARC Funds
		None		
		APPROVED EDA INVESTMENTS		
	Location	Description		EDA Funds
1	Fayette Courty	W. Va. Department of Natural Resources Nawks Nest-Tourism		157,000
2	Ansted	Ansted Sewage Collection System		1,349,000
3	Fayette County	Fayette Development Comm. Tourism & Recreation Study		1,000
4	Princeton	Princeton City Hospital		1,613,000
5	Bluefield	Mercer County Airport Feasibility Study		12,000
	Bluefield	Hercer County Airport Fessibility Study		30,000
6	Summers County	W. Ya. Dept. Natural Resources Pipestem Park-Tourism		1,087,000
7	Bluefield	Sewage System (Bluewell)		1,699,800
8	Scarbro	White Oak Sewer System		1,492,700
9	Fayetteville	Sewer Facility Expansion		140,000

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Table 8-A Geography

Countles	Area (Sq. Mt.)	% Area of State	Ares in Farms (Sq. Mi.)	*	Area Urban- ized (Sq. Ml.)	*	Remaining % (Sq. Mt.)	*
Fayette	659	2.7	75.8	11.5	5.1	8	578.1	7.78
Mercer	417	1.7	158.5	38.0	7.8	1.9	250.8	60.1
Monroe	473	2.0	259.8	54.9	1.3	e.	211.9	44.8
Raleigh	\$09	2.5	95.4	15.8	5.9	1.0	502.7	83.2
Summere	358	1.5	146.9	41.0	1.6	7.	209.5	58.6
Totals for Region	2, 511	10.4	736.4	29.3	13.7	٠.	. 9 1,752.9	8.69
State	24,079	100.0	8,248.2	34.3	314.2	1.3	1.3 15,516.6	64.4

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Sources: U. S. Census of Population 1960; U. S. Census of Agriculture 1964; West Virginia Department of Commerce, Planning and Research Division, "West Virginia Incorporated and Unincorporated Communities."

Table 8-B Population

Counties	Population 1960	Population 1950	% Change 1950-60	Pop. 8q. Ml.	Urban Pop. as % of Total	Rural Farm Pop. as % of Total	Rural Non-Farm Pop. as % of Total
Payette	61,731	82, 443	-25.1	7	11.2	3.0	85.8
Mercer	902'89	75,013	- 9.1	164	40.5	3.8	55.7
Monroe	11,584	13, 123	-11.7	25	-	36.7	63.3
Raleigh	77,826	96,273	-19.2	129	6.72	2.1	70.0
Summere	15,640	19, 183	-18.5	**	32.2	13.6	54.2
Totals for Region	234,987	286,035	-17.8	93.6	26. 1	5.3	68.6
State	1,860,421	2,005,552	- 7.2	11	3.8.2	6.5	55.3
Nation			+11.7	\$0.5	6.69	7.5	22.6

Sources: U . S. Ceneue of Population, 1960

Table 8-C Labor Force 1965

County	Labor Force	Employment	*	Employment % Unemployment	*
Fayette	14,270	12,380 86.8	86.8	1,890	13.2
Mercer	19,680	18,050 91.7	7.16	1,630	8.3
Monroe	3,173	2,842 89.6	9.68	331	10.4
Raleigh	18,980	17,320 91,3	91.3	1,660	8.7
Summers	3,730	3,380 90.6	9.06	350	9.4
Region	59,833	53,972 90.2	90.2	5,861	9.8
State	612,000	563,400 92.2	92.2	47,600	7.8
Mation	78,357,000	72,179,000 95.4	95.4	3,456,000	4.6

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Sources: West Virginia Department of Employment Security; Statistical Abstract of the U. S., 1966

V-129 -WVA

Table 8-D Employment 1965

Agriculture Mining Manufact. in 300 2.4 2460 19.9 2180 17.6 rr 690 3.8 530 2.9 2310 12.8 pr 410 2.4 15.4 5.6 281 9.9 pr 410 2.4 3450 19.9 1510 8.9 pr 2554 4.7 6568 12.7 6481 12.0 tryno 5.4 4.2 6568 12.7 6481 12.0										Transp. 4		Wholesale	ale 4									
100 2.4 2460 19.9 2.9	ounty	Agrica	Iture	Minin	,	Manuf	act.	Construct.	uct.	Commun	5	Retail	Retail Trane Finance	Final	10.6	Services	•••	Gove	Government	ō	Others	Total
494 17.4 158 5.6 494 17.4 158 5.6 494 17.4 158 5.6 19.9 11.0 5.4 17.0 5.9 12.7 6.5 11.0 6.6 19.5 12.7 6.5 11.0 6.6 19.5 12.7 6.5	ayette	300	2.4	0947	6.61	2180	17.6	1 612	6	965	€ . 8	1810	14.6	310	2.5	096	7.8	1940	15.7		12.9	1600 12.9 12,380
410 2.4 1450 19.9 1.4.6 6.6 19.5 14.8 5.6 19.5 14.8 14.8 14.9 1.1 17.0 6.6 19.5 19.9 19.9 19.9 19.9 19.9 19.9 19.9	dercer	069	3.8	530	6.2	2310		600 3.3 2176 12.0 4170 23.1 770 4.3 2430 13.5 2170 12.0	. 3	2170	12.0	4170	1 67	770		2430	13.5	2170	12.0		12.3	2210 12.3 18,050
410 2.4 3450 19.9 666 19.5 N.A. 2554 4.7 6568 12.7 8100 6.6 4240 4.6	fonrae	*6*	17.4	158	5.6	187	6.6	133 4	2.	158	3.8	412	11.5	5.3	8 -	274	9.6	324	11.4		555 19.5	2, 842
2854 4.7 6598 12.7	Agielei	410	2.4	1450	6 61	1510	*	740 4	. 3	890	5.1	3240	œ × -	200	2.0	2020	11.7	2190	12.6		2320 13.4	17,320
2554 4.7 6.568 12.7 31306 6.6 43300 W.S.	ummere	660	6 91	A. A.		140	-	Z		× z		480	14.2	9.0	2.3	480 14.2 70.2.3 300 8.9		570 16.8	16.8	400	400 11.8	2,620
11300 S F 42400		2554	1.	6963	12.7	(151)	12.0	1953 7	1	3808		10132	3.2	1703	- 1-	5084	13.3	4012	3808 18 7 10132 3 2 1703 11 1 5984 13,3 7194 13,1	7085	7085 7.5	53,212
21,000 1 0 1000	State	31300	5.6	47.800	5 %	1281.00	32.8	72000 3	2	0070	7.2	83400	8 4	13800	5 4	\$50.00	0	91500	2.		10.4	58800 10,4 563,400

Source West Virginia Lepartment of Employment Security

Region 8

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Plants	No. of Large Plants	No. of	Total Employment
Heavy Manufacturing	34	7	-	41	2,128
Light Manufacturing	39	7	1	47	2,817
Metals	6	-	1	7	1,552
Wood & Paper	35	-	-	35	795
Chemical	2	-	-	2	20
Petroleum	1	-	-	1	35
Glass & Pottery	8	-	-	8	95
TOTAL	125	14	2	141	7,442

Because wymbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

RECREATION

Recreation Resources: Include the southern segment of the eastern highlands; the New River with its scenic gorge, high water quality, fishing and challenging small craft and canoe floatway. The Greenbrier River is also an important recreation resource. Hunting is mainly for small game.

Regional Recreation Areas: Bluestone Reservoir - a power boating-water skiing, fishing, hunting and camping recreation complex. State Parks - include Bluestone Recreation Area, Hawks Nest, Pinnacle Rock and Babcock. Pipestem, under construction, will provide golf courses with superlative scenic views. An extra element of culture is provided in the Grandview Park Ampitheater. Public hunting area - Bluestone; public fishing - Plum Orchard and Moncove Lakes. Camp Creek State Forest - day use recreation. Stevens Lake, provided through local initiative, is of regional significance for fishing and boating.

Local Recreation Areas: Playgrounds 13; playfields 12; county or city purks 5; county camps 3; swimming pools 3. (An additional 20 areas are provided by the private sector.)

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SOCIAL OVERHEAD CAPITAL

Libraries

Region 8 is served by a book express in Summers County, five libraries in Fayette, Mercer, Monros, and Raleigh Counties.

Hospital

Region 8 is served by nine hospitals with a total bed capacity of 980.

Research Facilities

The two research facilities in this region are: U. S. Forest Products, W. Va. Institute of Technology.

Colleges	
College	Enrollment
Bluefield State College	1,397
Concord College	1,913
W. Va. Tech	2,048
Beckley Jr. College	1,102

Vocational Technical Schools

The major training schools in Region 8 are located in Fayette, Mercer and Raleigh Counties. Monroe and Summers Counties have small vocational training programs.

INDUSTRIAL SITES

1.	Montgomery Site	47 Acres
2.	Deepwater Site	35 Acres
. 3.	Scarbro Site	15 Acres
4.	Oak Hill Site	107 Acre
5.	Skelton Site	220 Acras
6.	Sprague Site	42 Acres
7.	Beckley #2 Site	9 Acres
8.	Beaver Coal Site	39 Acres
9.	Mabscott Site	75 Acres
10.	Hedrick Site	23 Acres
11.	Blue Jay Site	25 Acres
12.	Lester Site	12 Acres
13.	Glen White Site	25 Acres
14.	Crab Orchard Site	7 Acres
15.	Hinton North Site	18 Acres
16.	Hinton South Site	35 Acres
17.	Telcott Site	15 Acres
18.	Pence Springs Site	46 Acres
19.	Alderson Site	90 Acres
20.	Pickaway Site	27 Acres
21.	Spanishburg North	331 Acres
22.	Spenishburg Site	380 Acre:
23.	Shawnee Lake Site	75 Acres
24.	Shawnee Lake Site	185 Acres
25.	Shawnee Lake Site	55 Acres
26.	Peterstown Site	8 Acres
27.	Princeton Site	155 Acres

V-130 -WVA

This region, which is located in the coal fields in the southern portion of West Virginia, has experienced economic problems due to the decline in the demand for coal. The economy of this region, which is built around the coal industry, is now being affected by the increasing demand for coal. Other manufacturing has been induced to locate in the region; however, with the upturn in the demand for coal it would appear that coal will remain the primary industry for some time to come.

Industrial Wastes Program. In the past, not only has the economy suffered from the activities of the coal mining industry, but the Natural Resources have all but been destroyed by improper conservation practices. Streams that once were so grossly polluted with solid materials that they could not support any type of life have now been restored to their natural state. This only occurred after an extensive waste abatement was induced by the State and carried out by the coal industry.

Municipal Wastes Program. Not only has industry contributed to the degradation of streams in this region, but sewage from municipalities as well have contributed. Although since most of the municipalities have facilities to handle these wastes, a great amount of the population is not served as shown by the bar graph. Additional facilities, as well as the up-grading of existing facilities, are needed if this region is to meet water quality standards that have been set by the State.

Water Resources Development. Upon the restoration of its natural resources and the partial recovery of its economy, this region which has located in it a federal lake that offers broad water recreation, the Bluestone and New River which offer a variety of recreational opportunities undoubtedly with proper planning and development could all but alleviate its economic problems.

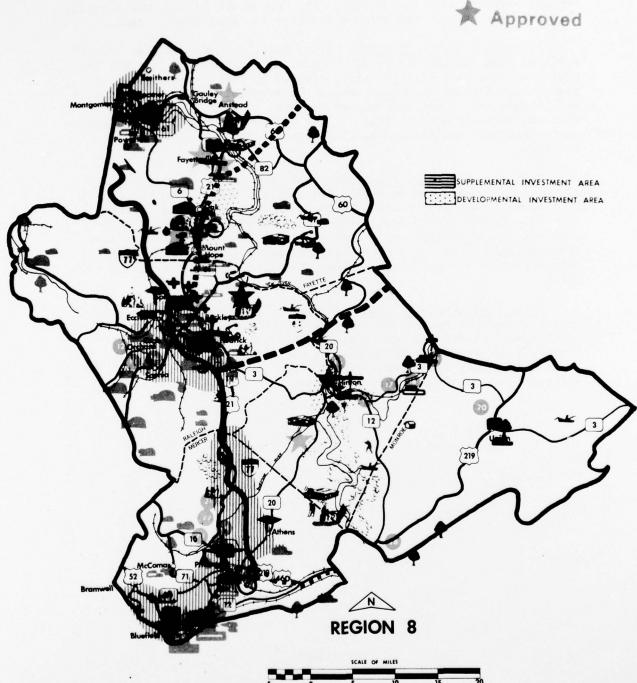
ARC INVESTMENTS



Pending

EDA INVESTMENTS

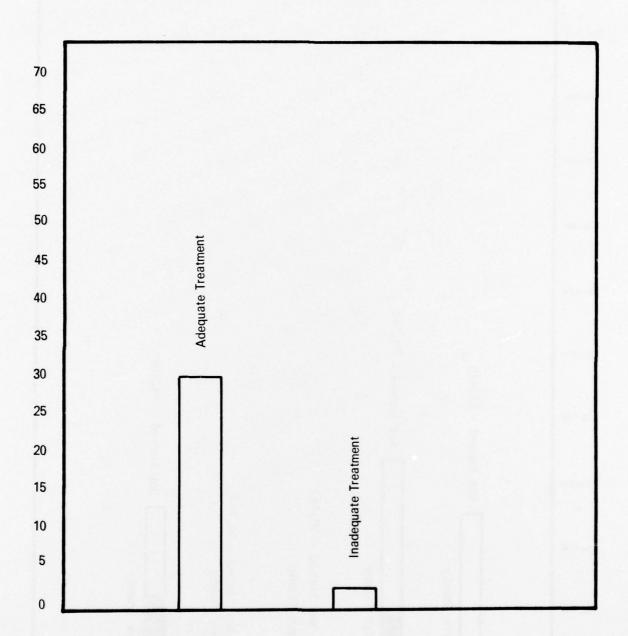




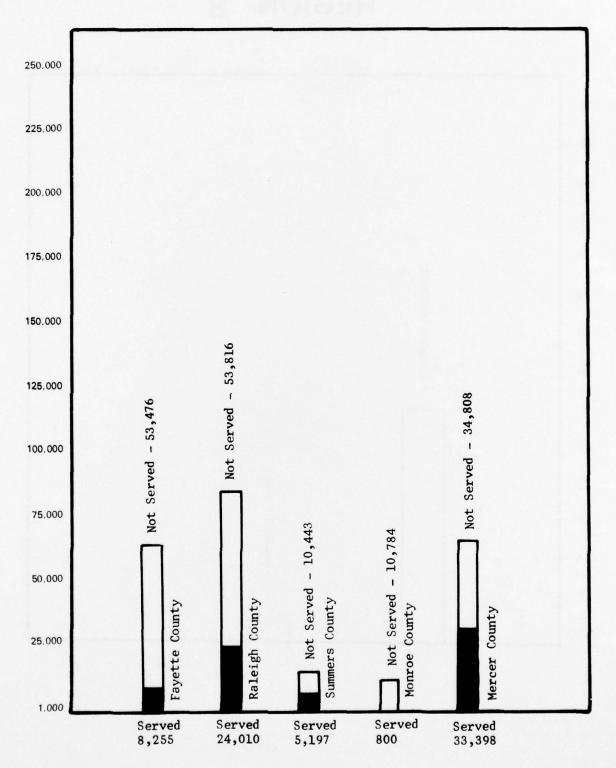
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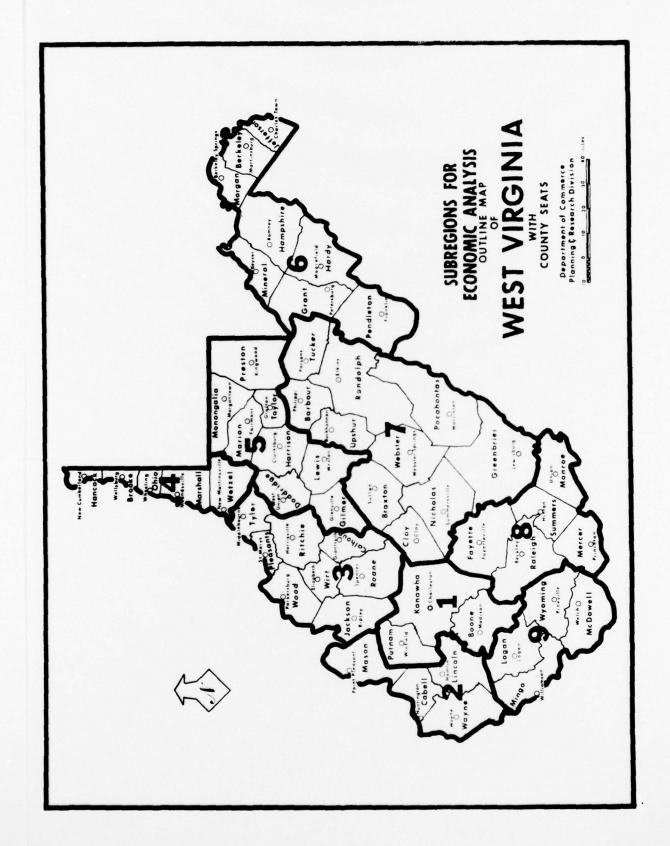
INDUSTRIAL TREATMENT FACILITIES REGION 8



MUNICIPAL TREATMENT FACILITIES REGION 8



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REGION IX

General. Region IX is composed of the four southern and southeastern counties of Mingo, Logan, Wyoming and McDowell. It is characterized by extremely rugged topography, a wealth of mineral resources in the form of vast deposits of bituminous coal, a widely dispersed though relatively dense population, and high levels of unemployment and poverty.

The topography of Region IX, as noted, is characterized by relatively rugged terrain with steeply sloping hills, narrow valleys, and relatively little level land. The majority of level land in the region is located in the narrow bottoms bordering the region's principal streams and their tributaries. As one would expect, principal population concentrations are located on the level lands bordering these streams, the Tug Fork which originates in McDowell County and separates Mingo County from the State of Kentucky; the Guyandot which originiates in Region VIII and passes through Logan and Wyoming Counties; the Clear Fork, and the multitude of other small streams in the region. These bottom lands and water courses serve, in addition, as the principal corridors for the rail and road transportation networks which tie together and traverse the region. Table 9A provides additional information about the geography of the region.

Transportation. With respect to transportation, Region IX is not nearly as well favored as some of the other regions of the State, and, in fact, it exhibits almost all of the problems of insularity, inaccessibility, lack of strong intra- and interregional linkages, etc., which one generally associates with "Appalachia". This is, of course, due in large part to the rugged terrain which characterizes the region and which makes highway construction, airport construction and other forms of transportation improvements very costly and often uneconomical.

It is in the area of rail transportation (freight) that the region is most favored. In fact, in this field it compares favorably with most areas of the State. Both the Chesapeake and Ohio and the Norfolk and Western Railroads have built main lines and spur tracks into virtually every corner of the region to permit the exploitation of its vast coal resources and to facilitate the transport of mined coal to markets and ports on the eastern seaboard. With respect to road and highway development, however, the region has not fared nearly so well. Until recently, the high cost of road construction and maintenance in areas of rugged terrain has discouraged investment in this element of infrastructure, and the region has consequently suffered through isolation from the flow of interstate and intrastate commerce, from sources of jobs for its people and markets for its raw materials and products; and, generally speaking, from the type of economic development from which the rest of the nation has benefited. This vacuum will, to a great extent, be filled when Appalachian Corridor G, scheduled for construction Logan and Mingo Counties, is completed. This

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highway will greatly improve the region's access to major intra- and interstate transportation links and thereby greatly enhance the mobility of the regional population and open new employment opportunities for the people of the region.

The situation, with regard to air transportation which has also been a major deficiency in Region IX, will be significantly improved with the scheduled construction of the general aviation airport at Williamson in Mingo County.

Population. Every county in Region IX lost population significantly during the decade between 1950 and 1960. The percentage losses varied from highs of 28% and 20% in McDowell and Logan Counties to lows of 16% and 7% in Mingo and Wyoming Counties. The loss for the region as a whole was 20.6% and estimates of regional population for the year 1966 indicate that population is continuing to decline and has declined 13% since 1960. (Table 9B)

The reasons for the continued decline in population are several and complex. Technological innovations in the coal mining industry as well as some of the other regionally important industries have resulted in significant losses of employment opportunities. In addition, there have been few new job opportunities created in the region to absorb the "structural unemployment" and the natural increase in population, and this factor also has contributed to the exodus of population from the region. Finally, agriculture which has always been a relatively marginal economic activity in this region, has become increasingly marginal in recent years. Many farm families have left their farms, and it might reasonably be presumed that many have left the region as well.

None of the four counties comprising Region 9 is very highly urbanized. The percentage of regional population classifiable as urban was only 12.6% in 1960, compared to 38.2% for the state and 70% for the nation. Rural farm population as a percentage of total population is very low in all four counties and is decreasing continually. Thus, over 86% of the population of Region IX is classiable as rural non-farm.

Employment and Economic Activity. Figures available for the year 1965 indicate that employment in the counties comprising Region IX is heavily concentrated in the mining industry. This has historically been the case in the region, and it is to be expected in the region which accounts for about 40% of the total bituminous coal produced in West Virginia and approximately 11% of the total U.S. bituminous coal production. In 1965, for the region as a whole, over 40% of total employment was in mining, compared to 8.5% for the State. The second most important source of employment in the region was the Wholesale and Retail Trade sector (13.5% compared to 14.8% for the State). The third ranking activity in terms of employment was Government (12.1% compared to 14.5% in the State).

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Region IX has been characterized for a number of years as an area of chronic high unemployment. The regional average in 1965 was over 13%, but unemployment varied from a high of 19.2% in Mingo County to a relative low of 6.6% in Wyoming County, the least populous county in the region. (Tables 9C and 9D) As in the case of population loss, high unemployment can be traced to structural changes in the regional economy (largely increasing mechanization in the mining industry) and a failure of the local economy to create enough new jobs to absorb those displaced by automation and those newly entered into the labor market. Manufacturing employment in the region is extremely low (1965 average -4.4%) relative to that of the State (23%) and the nation (30%). Comparison of figures relating to value added by manufacturing points up further the poor performance of the regional economy when compared to that of the State or of the nation.

Agriculture, as we have already noted, is of little importance in the context of the regional economy. Indeed, it is the negative aspects of the region's agriculture which are most remarkable. In all four counties the number of farms has been decreasing. Between 1954 and 1959 the number decreased at least 40%; and between 1959 and 1964 the number declined further 72% in McDowell and Mingo Counties; 75% in Logan County, and 82% in Wyoming County. Total acreage devoted to farm use decreased from 118,000 acres in 1959 to 68,000 acres in 1964. The value of all regional farm products sold totalled only \$404,000 in 1964 compared to \$476,000 in 1959.

Income. Estimates of 1966 per capita disposable income and median family reveal the disparity between the standard of living the inhabitants of Region IX and the vast majority of American citizens. In 1966 per capita disposable income varied from a low of \$1,273 in Mingo County to a high of \$1,565 in Logan County. This compares to a national figure for the same year of \$2,367. 1966 estimates of median family income ranged from a low of \$4,440 in Mingo County to a high of \$5,421 in Logan County. This figure compares to a national figure of just under \$7,000 for the year 1966.

<u>Problems and Potential</u>. The single industry nature of the Region IX economy is often cited as the major problem facing the region. However, the tremendous coal resources of the region are indeed an important asset and should not be treated as a liability.

Recent and anticipated developments in the coal industry indicate that coal production will increase significantly in Region IX and along with this will come an increase in employment opportunities. This increase in employment opportunity will be both in additional jobs and in better jobs for miners currently underemployed in "marginal" mines. However, efforts must be made to provide training programs to meet the demand for the highly skilled miners that will be required to operate the new mines.

Along with these training programs, a wide range of community improvement programs are needed to upgrade the quality of the living environment throughout the region. These improvements while often appropriate throughout the region are essential in the Supplemental Investment areas of Welch, Williamson and Logan and the Developmental Investment Area of Pineville - Mullens.

The educational programs of Region IX should be significantly strengthened if the region is to properly train its young people to enter the higher skilled labor force. The region's strong vocational training program should be constantly upgraded and efforts should be made to tie these training programs closely to the region's labor force needs. Educational T.V. would be a valuable program in the region and would improve the basic education program.

The rugged topography of the region necessitates the wise use of the region's limited developable land. However, there is ample developable land in the region if it is properly developed.

The southwestern part of West Virginia bordering Kentucky and Virginia is basically a coal producing area. In this area, the counties of Logan, Mingo, Wyoming and McDowell are designated as Region IX. The streams of the area are for the most part "headwater" type streams with the major river system being made up of the Guyandot River and the Tug Fork-Big Sandy River. The region may be considered rural to urban with Logan, Williamson, Welch and Pineville being the larger towns.

Municipal Wastes Program. As has been evident in the other regions of the state, the urban and rural areas are very badly in need of waste treatment facilities. McDowell County, with a population of 71,359 people, has treatment provided for only 1,393 of the total population or less than 2% supplied with waste treatment. Due to the small "coal camp" type villages prevalent in the area, the problem of waste treatment is very complicated. It is anticipated that a series of public service districts, with county support, may be necessary to cope with the domestic waste problem.

Industrial Waste Programs. With the coal industry being the leading, almost the only significant industry in the region, the waste abatement program is geared to that industry. The waste abatement drive, which started in 1953 for the coal preparation plants, has proven very successful. (Prior to 1953, the coal industry was exempt from water pollution law.) Streams that were laden with thousands of tons of coal waste solides in 1953 and as late as 1960 are now supporting many forms of aquatic life and fishing is once again becoming a practiced sport in the area. Surface water runoff and occasional "break down" cause darkening of the streams but the State surveillance program is reducing the frequency of the "break downs".

Mine drainage problems are "spotty" due to the types of coal mined in this part of the State. There are a few streams which are affected by mine drainage, but the majority of the streams in the area have escaped this problem.

Water Resources Development. Two federal impoundment facilities are planned for construction in the area. These facilities will add to the recreation potential for a section of the state which is definitely in need of the type facility planned.

Flood control efforts in both flood control dams and flood plain development projects are definitely in the high priority category in the area subjected to flooding. It is argued that the strip mining effects on the streams, basically siltation, are definitely a principal cause of the flooding experienced. If this is assumed to be true, then corrective measures in past mining errors and present mining practices must be accomplished before any major dredging program could be undertaken. It is the intent of the new strip mine reclamation legislation, effective July 1967, to perform the two primary tasks mentioned as being prerequisite to stream channel work.

Table 9-A Geography

Countles	Area (Sq. Mi.)	% Area of State	Area in Farm (Sq. Mi.)	3 %	Area Urban- ized (Sq. Mi.)	%	Area Remaining (Sq. Mi.)	7.
Logan	456	1.9	14.6	3.2	2.4	. 5	439.0	96.3
McDowell	533	2.2	21.3	4.0	6.9	1.3	504.8	94.7
Mingo	423	1.8	17.3	4.1	5.4	1.3	400.3	94.6
Wyoming	504	2.1	53.1	10.5	3.6	.7	447.3	88.8
Totals for Region	1,916	8.0	106.3.	5. 5	18. 3	1.0	1,791.4	93.5
State	24,079	100.0	8,248.2	34.3	314.2	1.3	15,516.6	64.4

Sources: U. S. Census of Population 1960; U. S. Census of Agriculture 1964; West Virginia Department of Commerce, Planning and Research Division, "West Virginia Incorporated and Unincorporated Communities."

Table 9-B Population

Countles	Population 1960	Population 1950	% Change 1950-60	Pop. Sq. Mi.	Urban Pop. as % of Total	Rural Farm Pop. as % of Total	Rural Non-Farm Pop. as % of Total
Logan	61,570	77,391	-20.4	135	12.3	1.0	86.7
McDowell	71,359	98,887	-27.8	134	11.7	5	87.8
Mingo	39,742	47,409	-16.2	94	17.0	1.3	81.7
Wyoming	34,836	37,480	- 7.2	69	10.2	3.1	86.7
Totals for Region	207, 507	261, 167	-20.7	108.3	12.6	1.2	86.2
State	1,860,421	2,005,552	- 7.2	77	38. 2	6.5	55. 3
Nation			+11.7	50.5	69.9	7.5	22.6

Sources: U. S. Census of Population, 1960

Table 9-C Labor Force 1965

6	Labor Force	Employment	*	Employment % Unemployment	6
Logan	15, 359	13,207 86.0	86.0	2,152	14.0
McDowell	15,060	13,130 87.2	87.2	1,930	12.8
Mingo	8,850	7,150 80.8	80.8	1,700	19.2
Wyoming	8,760	8, 190 93. 5	93.5	870	6.5
Region	48,029	41,677	86.8	6, 352	13.2
State	612,000	563,400 92.2	92.2	47,600	7.8
Nation	78, 357, 000	72, 179, 000 95.4	95.4	3,456,000	4.6

Sources: West Virginla Department of Employment Security; Statistical Abstract of the U. S., 1966

Table 9-D Employment 1965

ricu	County Agriculture	Mining	ng	Manuf	act.	Manufact. Construct.	uct.	Transp.	Transp. & Commun.	Wholesale & Retail Trade Finance	le & Trade	Finan	ce	Servi	ces	Governm	ent (Services Government Others	Total
1.8		234 1.8 5119 38.8	38.8		5.4	264	2.0	808	6.1	1760	13.3	264	2.0	883	6.7	1714	13.0	717 5.4 264 2.0 808 6.1 1760 13.3 264 2.0 883 6.7 1714 13.0 1444 10.9 13,207	13,207
1.	-	McDowell 160 1.2 5980 45.4	45.4		2.9	200	1.5	470	3.6	1710	13.0	200	1.5	1060	8.1	1560	11.8	380 2.9 200 1.5 470 3.6 1710 13.0 200 1.5 1060 8.1 1560 11.8 1455 11.0 13,175	13,175
1.	3	90 1.3 1740 24.3	24.3	390	5.4	130	1.8	006	12.6	1450	20.3	140	2.0	260	7.8	026	13.6	390 5.4 130 1.8 900 12.6 1450 20.3 140 2.0 560 7.8 970 13.6 780 10.9 7,150	7,150
260 3.2		4100 50.1	50.1	350	4.3	180	2.2	790	7.6	730	8.9	80	1.0	380	4.6	800	8.6	350 4.3 180 2.2 790 9.7 730 8.9 80 1.0 380 4.6 800 9.8 310 6.2 8,180	8,180
-	.9	744 1.9 16939 40.6	40.6	183	4.4	774	1.9	2968	7.1	5650	13.5	684	1.6	2883	6.9	5044	12.1	7 4.4 774 1.9 2968 7.1 5650 13.5 684 1.6 2883 6.9 5044 12.1 4189 10.0 41,712	41,712
5	9.	31300 5.6 47800 8.5 128600	8.5	128600	22.8	22000	3.9	40600	7.2	83400	14.8	13800	2.4	55600	6.6	81500	14.5	0 22.8 22000 3.9 40600 7.2 83400 14.8 13800 2.4 55600 9.9 R1500 14.5 58800 10.4 563,400	563,400

Source: West Virginia Department of Employment Security

Region 9

INDUSTRIAL FACILITIES

Small plant = 0 to 99 employees Medium plant = 100 to 499 employees Large plant = 500 or more employees

Industry Group	No. of Small Plants	No. of Medium Plants	No. of Large Plants	No. of	Total Employment
Heavy Manufacturing	11	2	-	13	548
Light Manufacturing	23	2	-	25	636
Metals	4	-	-	4	20
Wood & Paper	14	1	-	15	461
Chemical	1	-	-	ı	20
Petroleum	2	-	-	2	3
Glass & Pottery	6	-	•	6	81
TOTAL	61	5	-	66	1,769

Because symbols on overlay are by city and not by plant there will not be a symbol for every plant listed on this table.

SOCIAL OVERHEAD CAPITAL

Libraries

Region 9 is served by a book express in Wyoming, Logan and McDowell Counties, one library in Logan County and one library in McDowell County. Mingo County is served by a regional library.

Hospitals

Region 9 is served by eight hospitals with a total bed capacity of 702.

College

College Enrollment
Logan Branch (Marshall University) 287
Williamson Branch (Marshall University) 228

· Vocational Technical Schools

The major vocational training schools in Region 9 are located in Logan County. There are large vocational training programs in the remaining counties.

RECREATION

Recreation Resources: The Big Sandy River, Guyandot River and Twelve Pole Creek are the principal streamways. Hunting is primarily for small game. Fishing is for warm water species and will improve in proportion to the care of the watersheds.

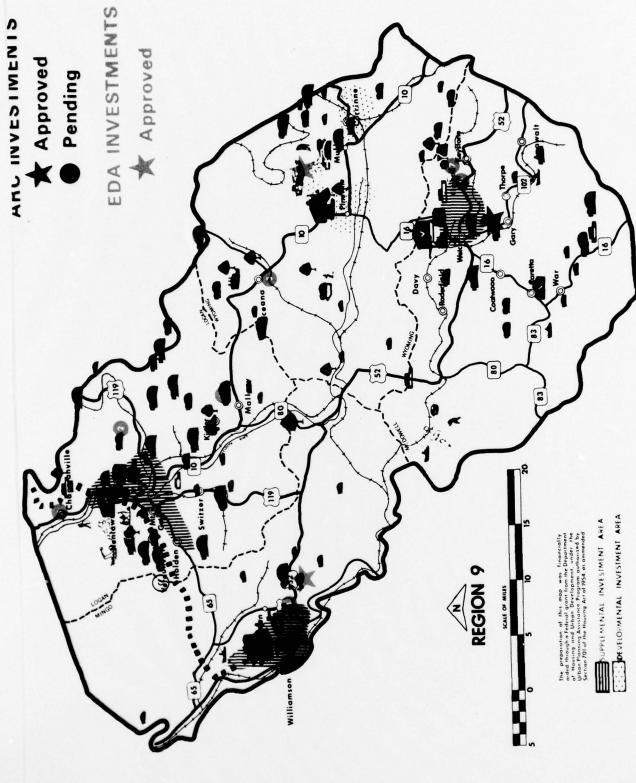
Regional Recreation Areas: State Parks - Twin Falls will provide golfing, swimming, picnicking and natural areas. Chief Logan Recreation Area provides day use activities including swimming and picnicking. Panther State Forest offers hunting, camping and fishing. Horse Creek, Berwind and Laurel Creek Lakes supplement fishing in the region. R. D. Bailey Reservoir will provide a day use broad water area for power boating, water skiing and some camping.

Local Recreation Areas: Playgrounds 35, playfields 21, county and city parks 3, swimming areas 4.

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INDUSTRIAL SITES

1.	Smith Site	30	Acres
2.	Airport Site	100	Acres
3.	McDonald Site	40	Acres
4.	Sprigg Site	39	Acres
5.	Oceana Site	4,000	Acres
6.	Vivian Site		Acres
	Keystone Site		Acres



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CORPS OF ENGINEERS



U. S. ARMY